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The British Association

ELECTRICAL men who are directly interested today in their own special institutions and other organisations sometimes think it strange that for many years the Congress of the British Association for the Advancement of Science was the chief professional event of the summer.

I.E.E. reunions and electrical conventions had not been thought of, so the "B.A." was the recognised occasion for the assembly of professors and students of electrical science and engineering from all parts of the country. Brilliant scientists and inventors—Kelvin, Crookes, Michael Foster, J. J. Thomson, Ewing, Ayrton and Perry, Charles Parsons, Ramsay, Rutherford, Lodge, the Hopkinsons, Silvanus Thompson, and hundreds more of eminence, regaled us in addresses, lectures and debates with intellectual and oratorical feasts which, in the opinion of some who heard them, still stand unsurpassed.

There was an eagerness amongst electrical engineers and inventors to contribute papers, for other suitable platforms were few. Numerous epoch-making reports and debates on fundamental electrical units and standards are recalled, and new discoveries were brought into publicity for the first time, the pages of the ELECTRICAL REVIEW being filled for weeks together with the proceedings. In short, in all sorts of ways, the British Association performed a substantial service to the cause of electrical science.

To-day—well, times are changed altogether, and our specialised needs as a vast profession and industry have compelled us to divide into groups. There is now no common meeting ground which admits all electrical interests.

It is not surprising in view of what we have said, that our customary study of the advance programme of the B.A. meetings, which begin at Nottingham next week, fails to excite any electrical enthusiasm.

Sir Edward Poulton, the president, has chosen as the theme for his address "The History of Evolutionary Thought," and some hundreds of scientific authors of various shades have prepared papers for the delectation of those who attend the meetings of the many sections, but unless there are surprises, such as one hardly expects, the proceedings in the Engineering Section will give but a poor yield of directly electrical matter. Electrical engineers do not seem to have competed so furiously for the honour of reading papers as did their predecessors. One is tempted to wonder whether any effort is made to secure their co-operation. Electricity is hardly a minor part of engineering now. Perhaps the explanation is that it is so big that it has become embarrassing?

Happily, we may anticipate something useful from Prof. E. W. Marchant on electrical vibrations and their applications in television, and Dr. O. Faber will introduce certain aspects of heating and air conditioning. Probably the principal contribution to the Engineering Section, the chief place where electrical matters are given a hearing, will be the opening address by Sir Alexander Gibb on research in engineering, on the morning of September 2nd, while another profitable feature will be a discussion, to be opened by Prof. F. G. Baily, on the training of university graduates for the engineering industry, to which Mr. A. P. M. Fleming and Dr. W. Jackson will contribute.

In the Mathematical and Physical Science Section arrangements a symposium on X-ray methods and industry is included, and a few more or less electrical contributions are expected. In the Psychology Section we come down to earth with such matters as the selection of sales managers, salesmanship, and factors determining likes and dislikes for work! For the rest there is little to satisfy our electrical curiosity, and we close our eyes in holy contemplation of "a physiological effect of Lophodermium macrosporum on the needles of Picea excelsa" or "the morphology of the rhizophoric parts of living Lycopods" (Botanical Section).

The Radio Exhibition

THE opening of the National Radio Exhibition at Olympia on Wednesday this week signalised the commencement of a new radio season from the sales point of view. Technically, the exhibition has come to be regarded in recent years more as a record of the previous year's progress in design than as a display of brand-new technical achievements, owing to the fact that, in general, new developments are not held up until the opening of Radiolympia, but are released in new receivers from time to time during the year. This year, as was forecast in an article published on page 241 last week, detail improvements in design are to be seen, but there are few major technical advances. Domestic radio receiver construction has now reached a point where, failing the discovery of some entirely new principle of reception, it seems unlikely that anything but minor developments can be embodied in those home receivers where cost has to figure largely in the designer's problems. Next week an article written as a result of a detailed inspection of the exhibits will be published.

New Lighting Campaign

THERE are still a surprising number of homes without the benefits of electric lighting and many more in which the standard of illumination is well below that generally recognised in scientific circles as the minimum. As stated elsewhere in this issue, manufacturers are prepared for a much bigger demand for lamps during the coming season and are launching publicity schemes, probably, more elaborate than ever before. The co-operation of two more E.L.M.A. members in the "Better Light—Better Sight" campaign should add still further strength to the scheme which had such a successful commencement last autumn. Never before were conditions so favourable to the development of the lighting load, and efficient lighting in the home should, in the natural course of events, be quickly followed by the installation of numerous domestic appliances in the hundreds of thousands of new houses that have come on to the mains recently.

Commercial Rural Development

IT is one thing to build up a distribution organisation and network for the supply of electricity to consumers in a rural district, and another to make it pay. An excellent example of commercial enterprise in this way is the Westmorland system, described later in this issue. In four years the 700 square miles has been "covered" to the extent that there are now well over 5,000 consumers, representing a total connected load of over 11,000 kW, out of a total population of only 47,000. Considering that the largest township in the area has only about 3,000 inhabitants, this is a very creditable achievement.

Declared Voltages

A CONSUMER cannot just ask a contractor to supply a lamp or other piece of electrical apparatus for working off the mains supply. He must first of all find out the voltage, which varies from town to town and quite often between different parts of the same town. In view of the way in which the electricity supply industry has grown up such anomalies are no doubt inevitable, but changes are being made gradually to the standard 230V, a.c. (Over 400 undertakings now declare this voltage compared with about 80 fifteen years ago.) It is not likely that the Electricity Commissioners, whose consent is necessary to an alteration in voltage, would approve the suggestion made in our Correspondence section this week that more than one voltage should be declared on the same distributor to avoid the need of voltage regulation, even within the generous margin of ± 6 per cent. now permitted. The supply engineer cannot expect relief from his obligations by asking the manufacturer to supply and the dealer to stock appliances to suit a variety of voltages. Nor should the consumer be expected to worry about details of this kind. The engineer should supply enough copper in the first instance and then introduce one of the many good regulating devices. After that comes the need to run high-voltage feeders to new sub-stations, this including independent high-voltage supplies to concentrated loads and large motors.

Air Conditioning at Sea

FROM certain aspects the most notable feature of the s.s. *Orcades* (to which full reference is made on pages 277 and 288) is the use of conditioned air in public rooms and some of the cabins. More than ventilation and correct temperature are required for comfort. Humidity has also to be controlled within fairly narrow limits. In the tropics the atmosphere is often uncomfortably damp, and to reduce the temperature without extracting moisture from the air makes things worse, since relative saturation tends to increase to dew point. This implies the need for refrigeration and rewarming. On the other hand, in colder climates—and extremes are likely to be encountered on many sea voyages—air, after warming, is likely to become unpleasantly dry. Full air conditioning may be expensive, but it probably gives a greater return on outlay in promoting a feeling of well-being among passengers than do most of the other factors that contribute to the same end. Moreover, passengers are better able to appreciate the various other amenities provided if the basic need to breathe air at the most suitable temperature and humidity is provided for.

Electric Fans

IN our few summer days it is as well to remind ourselves that the common office or the domestic fan has little to do with ventilation, *i.e.*, the removal of air containing too much CO_2 and other products of combustion, and its replacement by relatively uncontaminated air, which is the function of the extraction or the exhaust fan. It performs duties that are certainly not less important, however. It disperses the heat generated by the human body (rather more, on an average, than that given off by a 100-W lamp), and, merely by keeping the air in motion, assists respiration through the skin. The first is obvious enough in warm weather, but the second is desirable at all times—not least in colder seasons, when windows may be shut to exclude damp draughts. Although a window of leaded panes may give as much as one and a half changes of air each hour, that is not enough to prevent the atmosphere from feeling stagnant, and a noiseless and unobtrusive electric fan ought to provide an all-the-year load. The consumption individually would be small, but taken in the bulk it should assume considerable dimensions.

Colour-Light Signalling

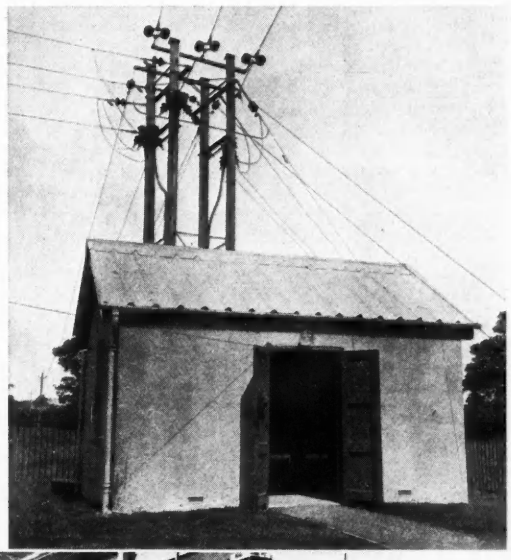
DELAYS to transport due to fog may be increased by the time lost in getting the fogmen with their detonators on to the job. This is especially the case in large towns, where the men may live a long distance from their work, and a fog may come up quickly and be dispersed before they arrive. Lt.-Col. Woodhouse, in his report to the Ministry of Transport on the accident at Bow Station in April, has such considerations in view in expressing the hope that the L.M.S. Co. will find it practicable to extend its existing colour-light signalling on the Broad Street—Poplar line, which carries dense traffic and is particularly liable to fog. This method of signalling has proved successful, we believe, wherever it has been introduced. In addition to giving a quick response to changing conditions, by permitting wider areas of more positive control to be adopted than are practicable with other methods, it should lessen operating expenses.

Electricity Supply in Westmorland

Layout of the distribution system

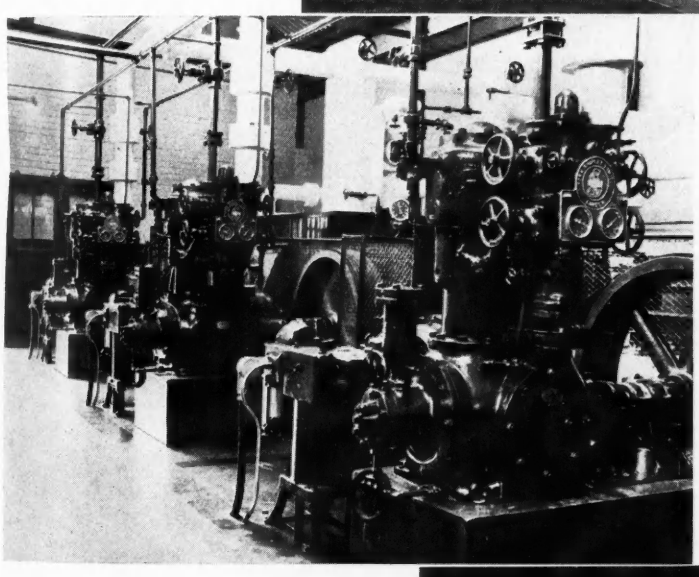
BY the courtesy of the Westmorland and District Electricity Supply Co., Ltd., we were recently able to see what has been done in the short period which has elapsed since June, 1933, by way of erecting the distribution system and developing the area commercially. The area is about 700 sq. miles, with a population of about 47,000, or 67.2 per sq. mile. Because of a comparatively wide strip of almost uninhabited fell land running latitudinally across the centre of the area the north and south districts have been developed as two entirely separate systems.

A bulk supply is taken from the Central Electricity Board in each case—at Penrith in the north and at Kendal in the south. At Penrith the supply is taken direct at 11,000 V and is transmitted to a switching station at Clifton Cross, while at Kendal the bulk-supply pressure is 33,000 V, which is reduced to the common distribution pressure of 11 kV in the company's sub-station in the town.



Beetham switching station and interconnector poles
[Elec. Rev. photo.

Each system has been developed on the ring-main principle, aided, particularly in the north, by the geographical ring formation of the roads, with towns and villages clustered about them. In the north a primary ring—Clifton Cross-Great Strickland-Appleby-Clifton Cross—with a secondary ring—Great Strickland-Tebay-Kirkby Stephen-Appleby-Great Strickland—superimposed upon it may be considered as one outer ring, with Appleby-Great Strickland and Newby-Shap interconnectors.



The receiving station for the southern area at Kendal
[Elec. Rev. photo.

Similarly, in the south the primary ring—Kendal-Milnthorpe-Beetham-Crooklands - Kendal—with its superimposed secondary ring—Milnthorpe-Arnside-Carnforth-Burton - Kirkby Lonsdale-Crooklands-Milnthorpe—may be considered as one outer ring, with Crooklands-Milnthorpe and Burton-Beetham interconnectors. At the various interconnecting and major supply points switching stations have been introduced, rendering it possible to operate the networks as closed systems. Sheet-steel truck-type switchgear is employed in the switching stations, with oil circuit-breakers equipped with discriminative relay protection.

Spur lines are, of course, branched from the rings at all desirable points. Single-pole structures are used for single-circuit lines throughout, carrying 0.075-sq. in., 0.04-sq. in. and 0.025-sq. in. copper and cadmium-copper conductors for the ring lines and 7/12 s.w.g. steel and 0.025-sq. in. cadmium-copper conductors for the spur lines.

The average span is 425 ft. and "V" and "wishbone" cross-arms are employed, with 22-kV insulators. Except in parts of the northern area, where severe disturbances from lightning were anticipated, a continuous earth-wire is carried below the power conductors. In the other cases the earth-wire is above the conductors. Operating experience indicated a very bad area for lightning in the Kent Valley, but since the installation of lightning arrestors here interruptions due to atmospheric disturbances have been negligible. Generally, at the pole-mounted sub-stations drop-out D-type switch-fuses control the h.v. side, and ironclad switch-fuse units control the l.v. side of the transformers.

Outdoor platform-type transformers are employed generally in sizes from 10 kVA to 50 kVA. On the l.v. side distribution is by 0.1-sq. in and 0.06-sq. in. copper conductors in three- or single-phase vertical formation, with span lengths of 150 ft. In the larger villages a fifth wire is provided for street-lighting supply. There are on the system 167 miles of e.h.v. lines, 92 miles of l.v. lines, 132 sub-stations and 16 switching stations. Practically the whole of the equipment, both indoor and outdoor, used on the system was supplied by Johnson & Phillips, Ltd.

The Express Dairy Co.'s milk-cooling plant
[Elec. Rev. photo.

In the northern and southern areas during 1936, 3,200,000 and 4,300,000 kWh was consumed, respectively. Corresponding figures for the first 25 weeks of 1937 were 2,200,000 and 3,000,000 kWh, respectively. The sustained maximum demands for the northern and southern areas in 1936 were 1,040 and 1,240 kW, respectively. At the end of last year there was a total of 5,289 consumers for the whole

area, while the total connected load then amounted to 11,325 kW.

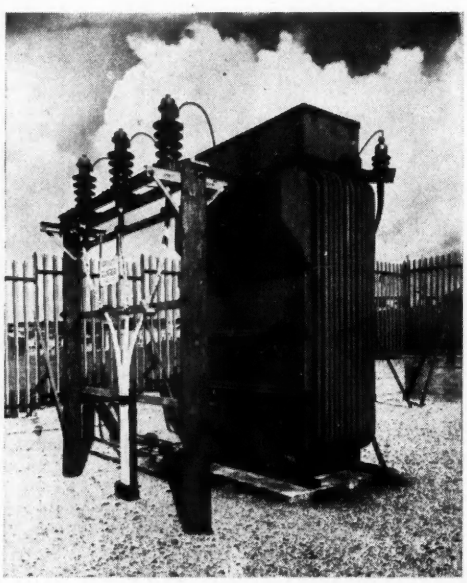
A Tour of the Northern Area

With Mr. L. R. Marshall, engineer and manager, as our guide we toured the northern area and, approaching it along the Kendal-Tebay road, the reason for the two separate systems soon seemed evident, although we were later to find out that impressions received from the main roads were not too reliable. With Shap Fell on our left and Longdale Fell on our right we climbed towards Tebay.

On the crown immediately before a drop down into Tebay we looked admiringly ahead along the Lune Valley. Good, indeed, but the consumers seemed to be lacking until we commenced to turn off the main roads, first left and then right, ferreting out villages and hamlets.

Tebay proved encouraging, however. Modern public lighting equipment caught our eye, and then the e.h.v. line from Shap—on the left wing of the secondary ring. This town is the southernmost point of the district and a railway junction, and the railway recently came on to the supply for station and engine-shed lighting and heating and for water pumping.

On the way to Ravenstonedale in the east the line in the valley illustrated the economics of system design—in the lowland but between and near properties. It also showed the price to be paid for continuity of supply. For miles there was the line without a tapping and then only for a handful of cottages, but it was part of the ring.



Outdoor transformer and 33-kV cable connection at the Kendal switching station

Our guide told us that the company had still to come to terms with a private supplier at Newbiggin. Diverging from the main road a little further on Ravenstonedale, with its church, vicarage and cottages, all on the system, offered a pleasant surprise. A few more miles of barren country, with a sight of the Pennines on the right, and then Kirkby Stephen, a very old market town and a fair sized one as they go in Westmorland. It has electric lighting on converted gas standards, served, in common with the town as a whole, by underground cable from the local sub-station which is separate from the switching station. The old castle at Brough, a few miles further north, has just been taken over by the Society for the Protection of Ancient Buildings. With Brough, Sowerby and Kaber, this village is served by a spur from Great Musgrave on the ring on the left which we had ceased to follow a few miles back.

Driving north-west from Brough the view ahead for miles revealed nothing likely for business, but another turn off the main road brought us to the pretty little village of Warcop with its "sub" on the ring line and three 3-phase distributors of the same structure. Returning to the main road we branched off to the right to the new milk and egg treatment station of the Express Dairy Co., Ltd. An underground 11-kV cable feeds this and for a consumption of 100,000 kWh per year 27,000 gallons of milk and 12,000 dozen eggs are handled each day. Over 200 h.p. of motors are engaged in cooling, agitating, pumping and churning on the milk side and a few small motors drive the egg-testing and egg-grading machines.

Appleby, with such links with the 12th century as the Castle and Moot Hall, and with its 1,785 inhabitants, 480 houses, 283 connected consumers and 470 or so kW of practically all domestic load, possesses two "subs." One is combined with an unusually compact kiosk switching station. It embodies five breakers, one on each side of the main ring, one on the interconnection to Great Strickland, one for the second sub-station, and one for the local transformer. The distribution system is underground.

Another deviation took us south-west from Appleby right across the centre of the ring to Shap on the other side, and looking back towards Appleby, with the Pennines in the distance, the "emptiness" of the area was again emphasised. Somewhere near the centre of the ring we saw Maulds Meaburn and Crosby Ravensworth, two little villages, each with just a few cottages. There is sufficient revenue from them to justify a 3,800-yd. spur from the Newby-Shap interconnector, all the same.

Activity at the granite works is reflected in the prosperity of Shap village and, in turn, in a good load for the undertaking. The services from the 3-phase vertical-formation distributors are as notable for their neatness as for their number. Actually the granite works is some distance from Shap and the quarry serving it is further south still at Shap Fell. This rural industry takes over 650,000 kWh per year for such processes as air compressing for drilling at the quarry, and crushing and concrete-pipe spinning at the works. The 1,000-h.p. or so of plant is served from a works sub-station fed, in turn, from another switching station on the works site. Another deviation from the Shap-Penrith road, following the left leg of the ring going north, brought us to the beautiful Lowther Village, with its spacious greens and a lay-out of cottages which would shame many a modern scheme. With electricity supply the amenity has been preserved in full. There is just one pole in the village and distribution is by means of under-eaves wiring.

Another two or three miles drive north and we were at Clifton Cross, where, in a building constructed of local slate and stone to fit into its environment, are the switches controlling the two main legs of the ring. There are no breakers on the incoming lines and we had to be reminded that Penrith, and not Clifton Cross, was the main receiving point.

Another drive across the area, this time eastwards and in the extreme north, brought us to the Thistle plaster works at Kirkby Thore, where supply is given at three points—at the works proper and at each of two mines some distance away. Drilling at the mines, haulage up the mine and quarry slopes, conveyance by aerial ropeways from mines to works, crushing and grinding, all employ some 640 h.p. of plant which interests the undertaking to the extent of 1¼ million kWh per year. The works sub-station here is also combined with one of the sixteen switching stations of the whole system. Although the plaster works is a little off the ring route, looping is effected by a double-circuit line with 33-kV insulators to give an alternative supply to such an important consumer. The higher-voltage insulators are used on account of dust from the works.

Another turn back across the district took us through Cliburn, where the lines are protected from prevailing winds by suitably placing them near trees; through Great Strickland, where another switching station is completely hidden in a field; and to Lord Lonsdale's residence, Lowther Castle. Before a public supply was afforded to the Castle and its workshops d.c. was provided by a private plant. Two 75-kW mercury-arc rectifiers now convert the public supply.

On our homeward journey we had a glimpse at the Lake District proper, as we drove along the west bank of Ullswater, passing Pooley Bridge on the area boundary. This northernmost point of Ullswater is supplied by a spur from one of the main Penrith-Clifton Cross feeders, and the spur embraces an experimental length (Eamont Bridge to Tirril) of underground 11-kV cable specially developed for rural work. It is unarmoured, has a lead thinner than normal, and is buried deeper than usual, but without cable covers.

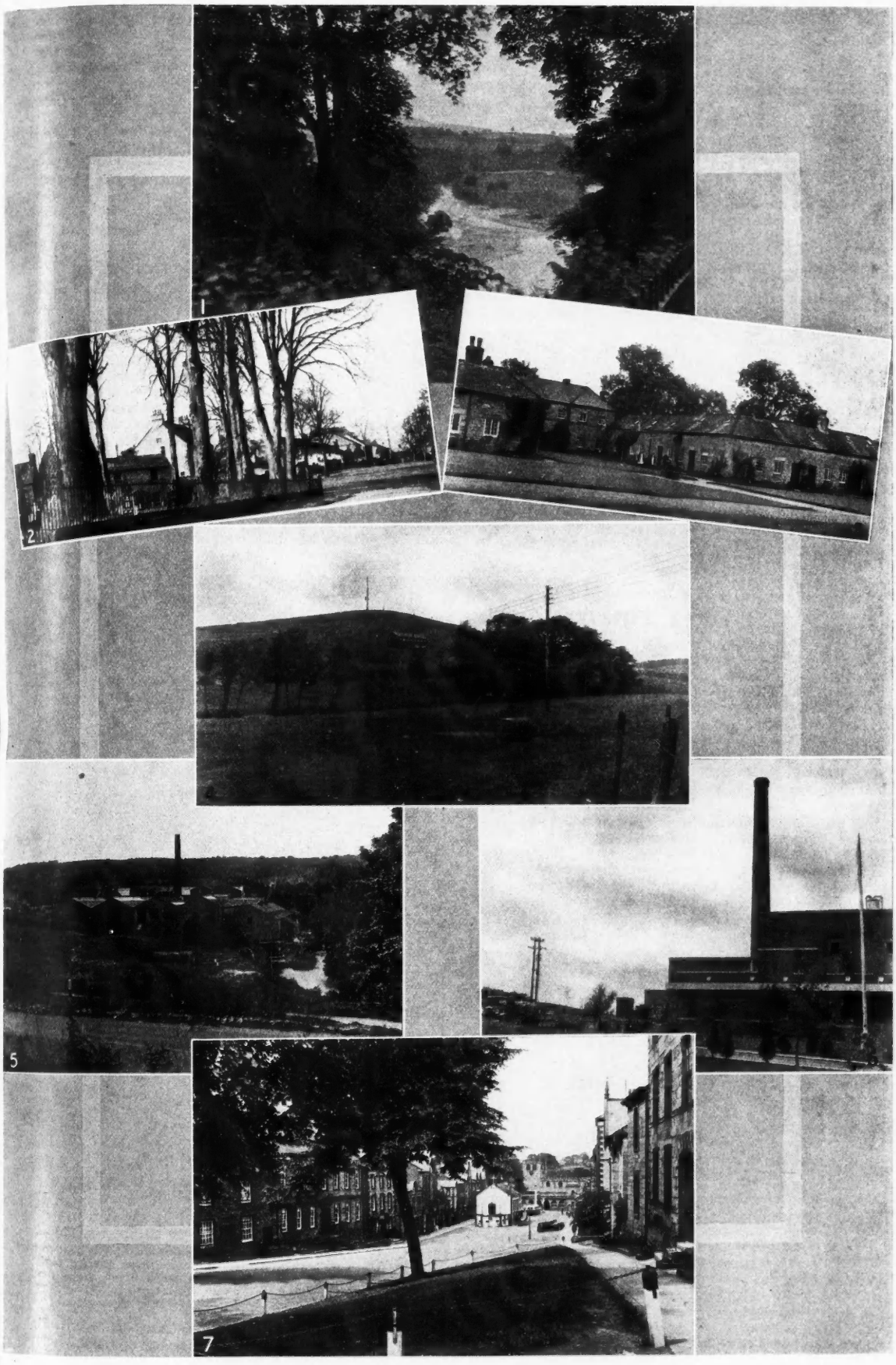
Survey work is now proceeding preparatory to affording a supply to a lead mine at Glenridding to the west of the south end of Ullswater, and from a point on the lake shore we could see in one direction how the line will follow the saddle at the back of Hallen Fell with a turn to the direct rise from the shore, all to preserve the natural beauty. The line will turn round the end of the lake and embrace Patterdale. A load of 500 kW is being catered for at the mine, where at present energy is derived from a private hydro-electric plant.

A fitting conclusion to such an interesting day was the experience of driving home through Kirkstone Pass with a sight of Lake Windermere in the distance in a burst of evening sunshine.

Features of the Southern District

The southern area is much more favourable to the supply engineer. It possesses a town of over 3,000 inhabitants—Carnforth—and its villages are much closer to one another and to the main roads. All the same there is not the "big industry" in the south to quite the same extent as in the north, although the paper mill at Beetham, with a consumption of two million

(*Continued on page 270*)



[*Elec. Rev. photos.*

Points in the Westmorland Company's Area

1. Site of River Lune crossing. 2. Temple Sowerby village in which the amenities have been unharmed. 3. Lowther village. 4. A three-phase service to Spittle Farm. 5. Beetham Paper Mills. 6. Libby's milk-canning factory. 7. Appleby market place, showing the Moot Hall and St. Lawrence Church

kWh per year for the processes of pulping, beating, paper-machine driving and calendering, probably restores the balance. Its installed h.p. is 1,200. There is a switching station at Beetham because it is at the junction of the two interconnectors within the greater ring, Milnthorpe to Crooklands and Burton to Beetham. The other switching stations in this district are at Milnthorpe, Crooklands, Kirkby Lonsdale, Burton, Carnforth and Arnside.

At Libby's milk-canning factory at Milnthorpe up to 25,000 gal. of milk is handled per day and for such processes as cooling, sterilising, pumping and homogenising about 400 h.p. of motors are installed and some 380,000 kWh per year is consumed. The next largest industrial concern is at Millhead, Carnforth, where 31,000 kWh per year is consumed.

One of the trials of the rural development engineer was brought home to us at Preston Patrick on the Kendal-Kirkby Lonsdale road, where the church and vicarage on the left from Kendal are supplied from a sub-station on the east ring, although the village is supplied from the Crooklands Beetham interconnector. Wayleave negotiating obstacles were responsible for this arrangement. Driving on this road we passed End Moor, Crooklands, Nook and Lupton, all within a stretch of four miles and each with its public supply. Lupton Towers farm is an example of an isolated supply for one house. A guarantee of revenue based on the actual cost of the line is asked for instead of a contribution towards the initial cost of the line. This practice is calculated to encourage extension of the use of electricity to other services.

At Spittle Farm, where there is a 3-phase line from the east ring electricity is used for milking, corn crushing, cooking and water heating. At Underley Hall estate, just outside Kirkby Lonsdale, public supply has replaced private generation and this is just one instance of how the undertaking is helped when the consumer realises that with public supply he is not restricted in use. In Kirkby Lonsdale, where we saw the 12th century church and the famous but now disused Devil's Bridge, there is a sub-station kiosk noteworthy for its special low construction to preserve the amenities. Near Kirkby Lonsdale is probably the only abnormal span on the system. It crosses the river Lune on the spur line to Casterton and is 700 ft. long.

One of the outstanding features of the area as a whole is the scattered character of some of the townships. Silverdale, for instance, has a population of 895, with 237 houses and 206 consumers, yet the length of distributor employed is 2,800 yd., representing roughly the street mileage. The connected load of the village is over 570 kW. Carnforth, the largest town, has 860 houses, 668 consumers and a connected load of 950 kW. Shap, a typical medium-size village, has a population of 762, with 279 houses and 216 consumers, representing a connected load of 338 kW.

The success of the undertaking is a striking instance of what can be achieved by a bold and progressive policy even in a district which is thinly populated and much broken up by uninhabited territory. Tariffs compare with, and in many cases are as favourable as, those of populous urban districts.

The organisation is controlled from the headquarters at Carnforth, where premises embrace both the offices and staff of the engineer and manager and the southern area engineer. They also serve as the southern area showroom. There is a district engineer for each area, who is responsible for maintenance and general development in his district. The northern district office and showroom are at Appleby. System extensions are dealt with from the head office. Each district engineer is assisted by a sales representative and a technical assistant. All extensions, including services, are handled by Johnson & Phillips, Ltd., who have been responsible for the design and erection of the system as a whole.

Lighting Installation at Earls Court

THE new exhibition building at Earls Court is remarkable in several respects apart from its size. The heating and other electrical features have already been described, while in the main hall a coloured illumination scheme has been carried out on ambitious lines.

The great ceiling span, which covers an area of approximately 400 ft. by 250 ft., reflects coloured lighting with continuously changing effects. Below the central span and surrounding it are three rectangular panels, each stepped down 3 ft. below the one above (as illustrated in our issue of August 6th).

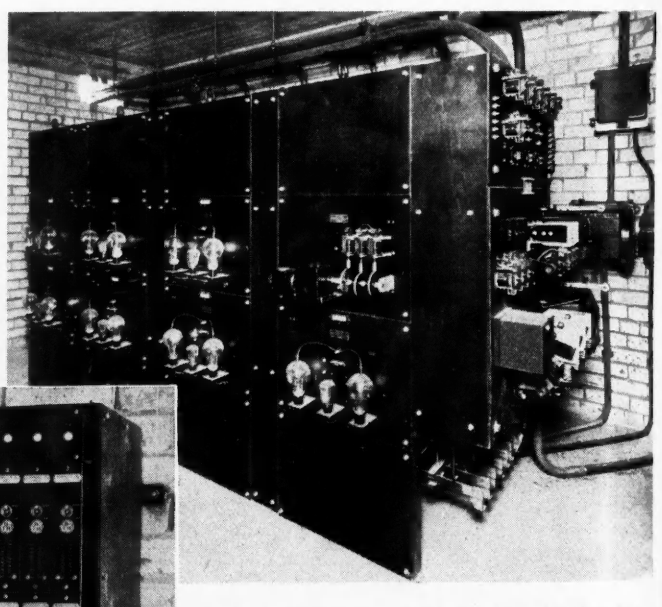
A lighting cove is provided for each panel in which equipment is concealed. A total of 416 specially designed "Mazdalux" high power floodlights have been installed, each unit being equipped with a selected filter so that the surface of the ceiling is evenly lighted by a "wash" of colour constantly varying in shade and intensity. The horizontal divergence of each beam is approximately 90 deg. with a vertical divergence of approximately 12 deg. The diverging beams from adjacent floodlights overlap and are continuously changing, producing a kaleidoscopic colour panorama. "Mazda" line filament tubular projector lamps are used throughout, of the following ratings and quantities: 288 of 500 W and 128 of 1,000 W each.

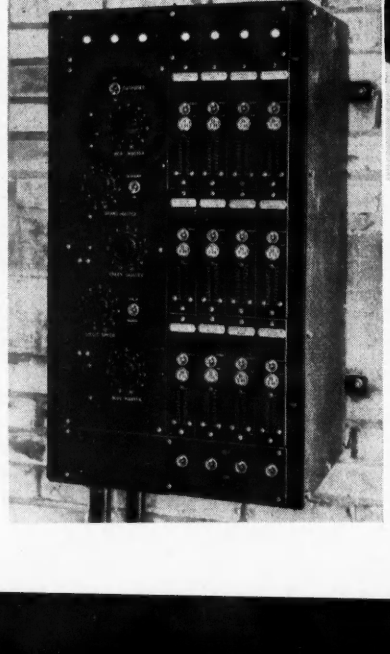
The whole colour lighting scheme is automatically controlled by a specially designed thyraton reactor dimmer. This apparatus, similar to, but larger than, that installed on the *Queen Mary*, is capable of controlling a lighting load of 328 kW, embodies twelve circuits, and is arranged for either cyclic or manual control, the master board being provided with colour masters and grand master control. No special ventilating equipment is required, such as is necessary with a resistance dimmer to dissipate the heat. In addition, the space required is comparatively small.

The swimming pool in the centre of the arena has a capacity of 2,250,000 gal. of water, and forty underwater floodlights with 500-W lamps are installed. In addition the B.T.H. Co. supplied equipment for special lighting effects in the sports arena comprising fifty-four spotlights, each with a 2,000-W projector lamp and eleven 80-A arc spotlights.

In the tea lounge, conference and banquet halls, as well as other rooms, offices and staircases, B.T.H. lighting fittings and lamps are installed, and in the foyers and entrance halls there is concealed indirect cornice lighting. Special reflector fittings are used in the car park.

All the equipment mentioned above has been installed by Electrical Installations, Ltd. Besides lighting equipment the B.T.H. Co. supplied large numbers of "M.V." electricity meters, while B.T.H. motors are used to operate the ventilating plant installed by the Norris Warming Co., Ltd.





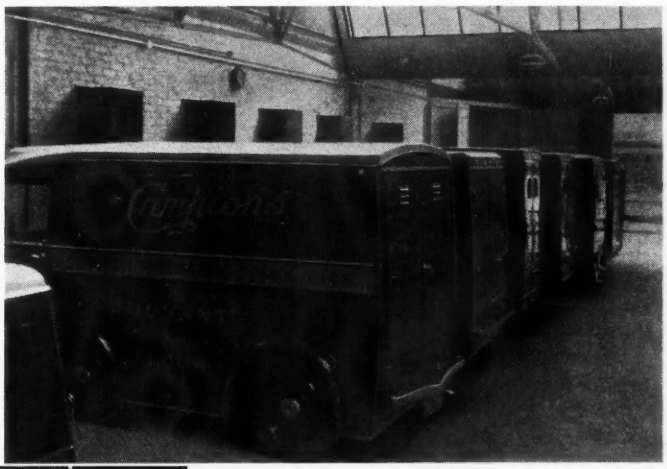
Left: The master control panel of the thyratron reactor dimmer which operates, by relays, the main contactors controlling the roof colour lighting. Above: One of the thyratron valve banks and reactors. Relays and contactors operated by the master control are seen on the right

Electric Vehicles in Service. By F. R. J. Jervis, B.Com.

Experiences at Portsmouth

PORTSMOUTH is a town most suitable for the development of the electric vehicle for retail delivery services. It is a closely inhabited urban area with a population of over a quarter of a million. As it is bounded by water on three sides, there is a limit to the spread of population. The countryward movement has to take place to the north, along the main roads. Except for Portsdown Hill, which bounds the city on the north, the surface of the town and the country is decidedly flat. There are no awkward hills to be negotiated, and battery vehicles are able to operate without danger of the charge proving inadequate.

Electric vehicles for delivery purposes were only introduced in 1933, but since that time progress has been most marked, and they are now a common feature of the local delivery services. They were introduced into the town in an experimental way. Mr. H. Beagarie, transport manager of Campion's Ltd., one of the largest of the local bakers, put one into service in August, 1933. The main object was to obtain data of the costs of operation under local conditions. There was a certain amount of "teething trouble," partly due to the fact that the Transport Department had had no previous experience of electrics, but it was decided to continue the experiments.



From top to bottom: Vehicles on charge at Messrs. Campion's. Some of the Portsea Co-operative Society's forty-four vans. A van being loaded up

Two more were delivered, one in November, 1934, and the other in March, 1935, as it was considered that a better idea of the capabilities of the electric would be obtained by putting three into service, and thus arriving at average figures which would cancel out any individual differences. The vehicles were put on to horse routes, and an accurate check was kept on them for over a year. The test was completely satisfactory and it was decided to order more vehicles and gradually to decrease the use of horse transport. A fourth was put into service in December, 1936, and two more in March, 1937. Last month an additional vehicle was placed on the rounds, so that the firm now has seven in active use.

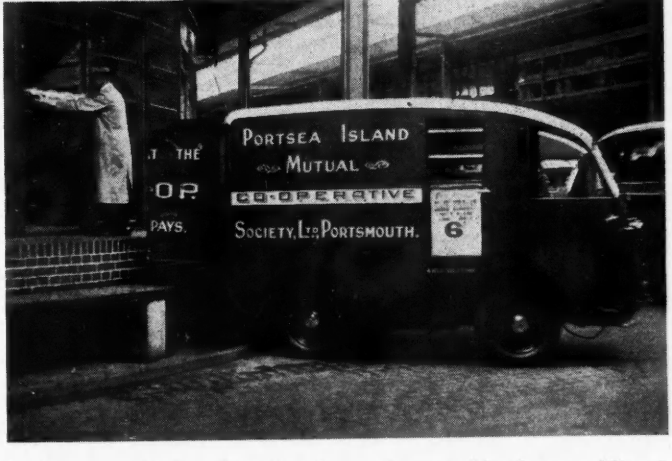
The electrics operate on the inner town route. They take the place of horses and a certain number of petrol motors. In the outlying and country districts petrol motor transport is still supreme. It is noteworthy that the decision to dispense gradually with horse traffic was taken before the introduction of the electric. An attempt was made to place petrol motors on the horse routes, but the change did not prove to be economical. At the present moment there are ten horses left out of a maximum complement of thirty-two (seven electrics have not replaced twenty-two horses, because petrol motors have been introduced on those routes as well).

The Portsea Island Mutual Co-operative Society introduced its electrics for a different reason. Its transport manager, Mr. Walton, had had previous experience of electrics and was considering their adoption. In 1934 a fire destroyed the main building and offices, the only part to be undamaged being the horse stables. When designing a new store the old stables were found to be in the way. It was a question of building entirely new stables or of adopting a different system of delivery. So the electrics got their chance sooner than they would have done under normal circumstances.

Six vehicles were introduced experimentally, two in October and four in December, 1934. They proved so successful that it was decided to dispense with the construction of the new stables and to purchase further electric vehicles to be used exclusively for city delivery. Between October, 1935, and June, 1936, thirty-seven were introduced into service. Since then another has been bought, so that the Society now operates a fleet of forty-four, and more are contemplated. The body was specially designed for the work required, and these vans appear in the maker's catalogue as the "Portsea" type.

Petrol v. Electricity

The practical experiences of these two concerns bear out the claims which have been made for the electric vehicle for retail delivery work. Obviously the limited sphere of operation is recognised. The routes covered are generally those formerly occupied by horse vans or the inner petrol motor routes. Both organisations have a very large trade in the outlying suburban and country districts, and for this the petrol motor is still supreme. The cost on the inner route for electrics is definitely cheaper than for petrol motors. The average mileage worked is about 20 a day, each van making between 250 and 300 calls. The average consumption of electricity is 11 or 12 kWh. This is supplied by the Portsmouth Electricity Department at a special rate of ¼d. a kWh, summer and winter.

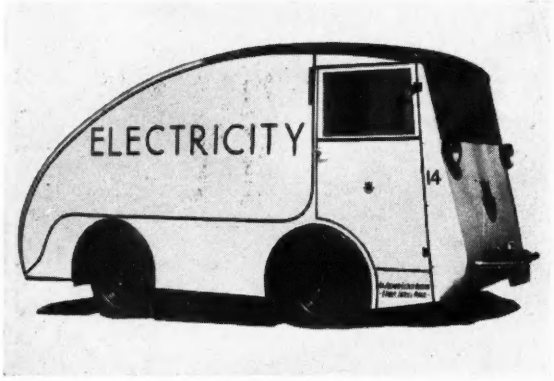


The lower speed is no handicap. Experienced transport managers find that that is a distinct asset. Not all drivers take the care of their employer's property that the latter would wish. With electrics drivers are unable to speed and then to rely on their brakes to pull up sharply. The consequent saving on the cost of tyres and spares is a considerable item to a firm running a large fleet.

The accident factor is of considerable importance. Too

many drivers rely on the power of acceleration in avoiding traffic, whereas the electric must slow down to avoid a collision, because when it is operating at its low maximum speed there is no margin of extra speed to be applied. Economically, the smaller liability to accident affects the insurance rates and the no-claims bonus. The life of the electric is much longer than that of the petrol vehicle. It is quite usual to depreciate the capital cost of the latter over not more than eight years. If the drivers are at all inclined to speed, even this estimate will prove to be excessive. The greater life of the electric must be offset against any possible higher purchase price.

The ascertained cost of the electric will vary with the efficiency of the costing service and the number of years over which the vehicles are depreciated. Some transport operating



A Morrison streamlined delivery van used by the Portsmouth Electricity Department

firms are notoriously deficient in their costing systems, particularly with regard to capital charges. But the Portsea Island Co-operative Society has accurate figures covering the costs with different figures for different numbers of years of depreciation.

A very fair figure for depreciation is 12½ per cent. for chassis and body and 25 per cent. for battery and tyres. The total charge, including depreciation and interest on the diminishing value of the total capital cost, but excluding driver's wages, as these are the same for all means of transport, is 30s. 6d. a week if ten years is taken as the "life" and 36s. 6d. a week if a shorter period is taken. The costs of a 10-cwt. petrol vehicle would be not less than 50s. a week on similar work and mileage, showing a clear saving of at least 13s. 6d. a week. There is, however, no 10-cwt. petrol vehicle which has the carrying capacity of the electric. For a similar load a one-ton petrol van is required.

At first glance the electrics appear to be small, but that is because of the economy of space in the design. They are able to carry 480 2-lb. loaves on removable trays, and twelve trays for pastry in a separate compartment. As there is no necessity for packing the bread, time is saved in loading and the goods reach the customers in a better condition.

The Electric and the Horse

Opinions seem to be divided as to the relative costs of horse and electric transport. Even in those firms where horse transport costs are cheaper the incidental advantages of the electric are considered to be worth the extra expense. The driver has better protection, and he does not get so wet. Nor do his hands become dirty through handling wet reins. Customers really appreciate their food being delivered to them by a vansman with clean hands.

Horse lovers always quote the intelligence of the horse in knowing the round better than the vanman, but this quality is much exaggerated. Not all horses are well behaved, and they are liable to go after a piece of paper in the road or to follow the driver across the pavement. Consequently, the driver has one eye on the horse and the other on the customer. These men are salesmen as well as drivers, and when driving the electric, especially in busy streets, they are able to concentrate their entire attention on the customer.

Although many transport managers have stated that the electric is dearer, but that it has other compensating advantages, it appears that even here a better case can be made for the electric. It all turns on the costing system. The running, and a part of the general costs, of horse transport are cheaper than the corresponding costs of the electric, and that is probably as far as many costing systems go. When the analysis is carried a stage further, entirely different costs emerge. Mr. Walton, of the Co-operative Society, is of the opinion that the electric is cheaper than the horse, and this opinion was reached after a long experience of a large number of many different types of vehicles.

The cost of storage space is of considerable importance in a large town where ground rents are high, and doubly so where the firms are expanding their business. Either they have to adapt their existing space to a large turnover or they have to acquire fresh land and buildings. An electric of large capacity occupies little garage space. Its "fodder" is obtained from a charger placed high on the wall so as to occupy no floor space, and the vehicle can be conveniently run out in the morning. In the case of the Co-operative Society the vehicles stand in their loading positions, with the chargers overhead and the backs of the vehicles butting on to the bakery from which supplies can be conveniently loaded into the vans in the morning.

With horse transport, on the other hand, there is the space occupied by the van, which is greater than that of an electric; the stabling of the horses; and the space occupied by the fodder. The total space occupied by horse transport is about three times that of the electric.

When all costs are taken into consideration, and in the long run they must be, it has been found that the cost of horse transport is 55s. 6d. for each vehicle a week, and that an electric of double the capacity costs at the most 28s. 6d. a week. In effect, the electric costs 65 per cent. of the cost of the horse van.

The two systems here described offer comparison between the rival merits of hiring or purchasing the batteries. Messrs. Campion's adhere to the policy of hire-maintenance. The reasons are that the firm has a fixed and definite figure for the cost of batteries each year. Repairs and adjustments to batteries are obviated, so that the garage staff is kept free for general repair work. Although the cost works out at a little more, the system results in a smoother running of the delivery service, which is of more importance than the saving of a few shillings. This policy is made possible by there being a good service from the manufacturer.

The Co-operative Society has a very wide range of activities in the city, and is not confined to the bakery business. Long before the introduction of the electrics it had a large and well-equipped garage (over 160 vehicles of all kinds are in service). Its larger fleet gives it a wider margin of reserve, so that it pays it to purchase its batteries outright and do its own maintenance.

The vehicles used in both cases are Morrison 12-cwt. vans, 60 V. The chargers are Westinghouse metal rectifiers. Vehicles are charged at night; in some cases where they are on short runs they are charged every other night, and when on long trips an equalising charge is put in at the week-end.

Thus two important concerns have now had considerable experience of the operation of the electrics for certain work and they are both completely satisfied with them. There has been an improvement in design, in accessibility and in the ability to manœuvre quickly in heavy traffic and awkward streets. There is no doubt that as fresh requirements occur more and more vehicles will be put into service. Apart from those which have been described, there are only a few isolated ones in use by other firms, totalling something over 50.

It is surprising that with the obvious success of the electric, where it has been thoroughly tested, more firms do not employ them for their delivery service. Possibly this is because a firm will buy fresh apparatus only when that apparatus is needed for renewal of existing stock, or for expansion of business. It is one thing to replace worn-out petrol vehicles with electrics, but quite another to scrap existing vehicles in order to try something fresh.

Progress in the West Midlands

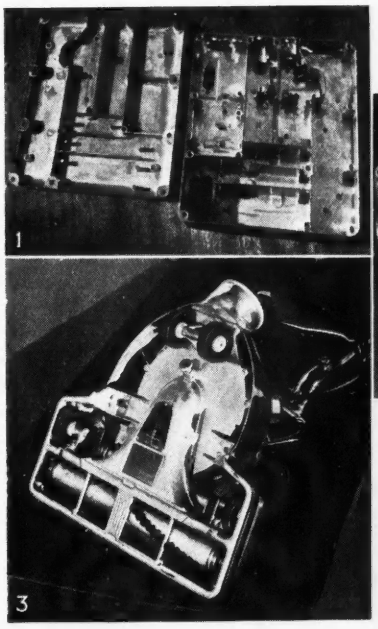
THE operations of the West Midlands J.E.A. during the year ended March 31st last are reviewed in the Authority's recently published twelfth annual report. Energy supplied in bulk to the Midland Electric Corporation for Power Distribution, Ltd., and the Wolverhampton, Walsall, West Bromwich and Shrewsbury Corporations amounted to 419.4 million kWh (at 0.388d. per kWh), against 368.1 million kWh (at 0.386d.) in the previous year, an increase of 14 per cent. In the Authority's Shropshire distribution area sales increased by 38 per cent. to 13.7 million kWh. A number of new h.v. consumers were obtained and it is estimated that 85 per cent. of the present industrial load in the area is now connected to the Authority's mains. Including certain other supplies and 68.2 million kWh exported to the C.E.B., the Authority sold 502.9 million kWh last year against 379.3 million kWh in 1935-36 (including 3.1 million kWh imported from the Board). Most of the supply was obtained from the Ironbridge station, which sent out 487.6 million kWh (303.7 million kWh in the previous year). The average thermal efficiency of this station for the whole year was 24.7 per cent., the maximum load on the two 50,000-kW sets being 112,400 kW, and the total kWh generated 519.8 million, giving a load factor of 52.8 per cent. A third 50,000-kW set and two 270,000-lb. per hr. boilers are to be installed by the autumn of 1938 and a fourth set, with three further boilers, by the winter of 1939. These will bring the station to the capacity for which it was originally designed.

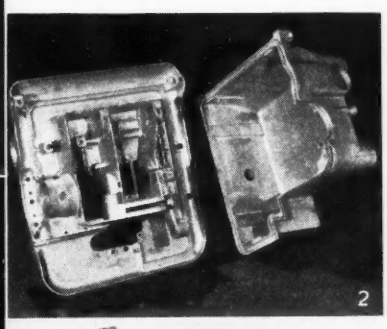
Die Castings. By H. Chase

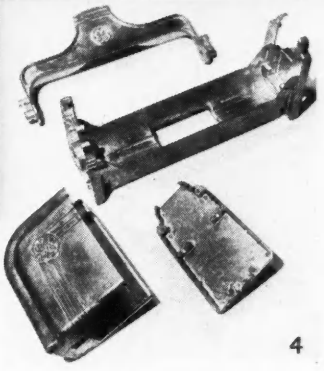
Their use in the manufacture of electrical products

THE use of die castings by the electrical industry in Great Britain is likely to be greatly accelerated by the rapidly increasing facilities for their production. Even more important is the availability of the high-purity zinc alloys as proved to be the case in America, where the older zinc alloys had given trouble because of intergranular corrosion. This fault has been overcome by using zinc of 99.99 per cent. purity, and limiting the content both of lead and cadmium to 0.003 per cent. maximum.

High-purity zinc alloys, which are now available in England, are used in the U.S.A. for about three-quarters of the total die casting production. Besides having excellent physical properties, they are low in cost, easy to cast even in quite thin sections and lend themselves to a great variety of applications. Castings can be made so smooth as to require only a light buffing before plating and most parts require little or no machining. Where low weight is essential or where temperatures in service exceed 300 deg. F., aluminium die castings find extensive use.







1. Zinc die castings forming the case for a radio control unit. 2. Housings for a high-speed electric sewing machine. 3. Vacuum cleaner. 4. Wringer and housing parts for an electric washing machine

Some of the aluminium alloys take and hold a polish without plating for considerable periods and they can also be ball burnished or given attractive coloured finishes. To-day, however, excellent organic finishes are available for zinc die castings which are easily and rapidly plated for many applications, whereas aluminium is rather difficult to plate.

In the United States die castings are used in larger quantities for electrical products than for any other purpose except motor-car parts. A good proportion of the electrical uses are in domestic appliances, housings for fractional horse-power motors, electric fans, electrically driven machines for office, sales room and factory applications, as well as in products for the beauty parlour, for radio equipment, for electric clocks and telephones and even for electric toys.

American kitchen mixer with base and motor housing die cast in zinc alloy

To make the best use of die castings it is necessary, of course, to have a product which sells in quantities sufficient to warrant the cost of the casting dies. In such cases the saving in machine work, as compared to sand castings, is frequently great enough to offset the die cost quickly. Often the die-casting die is less costly than a stamping die for a similar part and there are additional advantages such as more pleasing shapes, less or no machining, and ability to make one casting serve where two or more stampings would be required or to make more complex units.

It is not contended, of course, that a die casting is always either lower in cost or superior in other respects to stamped or to sand-cast products since each method has individual applications. Where any of the three can be used, however, the die casting deserves serious consideration, as it often affords some such advantage as better appearance, a smaller number of parts, greater rigidity, quicker assembly, material saving in machining and/or production cost, freedom from rusting, lighter weight, closer dimensions, or a design not attainable otherwise at comparable cost.

As an example, in the kitchen mixer illustrated, the motor housing, its supporting standard and the base are zinc die castings. These parts if sand cast would lack the smooth finish required and would need more machine work. Some of them might be stamped, but they would lack weight and rigidity, and could not have the attractive form of the die casting. If made of steel, rusting would be a problem, while non-ferrous stampings would be more costly.

To reproduce in any but die cast form the radio control case shown in the accompanying illustration with the thin sections and complex and accurate coring required would be almost impossible and certainly uneconomical. A stamped case would require many separate parts and would be without fastening bosses. The extra tooling and assembly needed would also increase the total cost.

Some of the parts of electric gramophones might be sand cast, but not with the close dimensions, complex coring and relative freedom from machining attained with the die casting. Other parts might be stamped but would probably cost more, would lack rigidity and would require added parts for lugs and bearings. Either zinc or aluminium castings have fairly good bearing qualities, suitable at least for light loads and moderate speeds. Bronze bushes or anti-friction bearings are readily put into cored recesses if required.

Sand-cast housings for high-speed electric sewing machines have not the close dimensions, thin sections, small accurately placed cores and smooth finish provided by die casting in zinc alloy. One of these castings has copper oil tubes cast in place. Machine work involves only drilling and reaming, and very little metal is removed. A stamped housing would need much more expensive dies and the addition of several extra parts which the die castings provide.

Desk telephones were originally die cast in aluminium alloy because of the faults formerly encountered with zinc die castings, before high-purity zinc alloys were developed. The latter are now used because they are heavier (a decided advantage in this instance), less expensive, easier to cast, and yield a smooth finish. The possibility of breakage resulting from a fall is much less, the impact strength of the zinc alloys being considerably higher than that of aluminium.

In one type of vacuum cleaner both zinc and aluminium die castings are combined. The underframe is a complex, thin-section part well suited for die casting in zinc, which is tough and not easily broken. Above this is the main body casting of the machine die cast in aluminium alloy to save weight. Sand castings for such parts would be too heavy and would lack accuracy and excellence of finish. To substitute stamped parts would be costly in dies and would yield parts likely to vibrate in use and produce resonant noises. This is avoided or minimised with the die castings and assembly operations are greatly reduced.

A recent development in the vacuum sweeper field is the use of magnesium die castings by one large American producer. These castings save considerable weight, even over aluminium, but are more difficult to produce. They require somewhat special machines, but are regarded as a noteworthy achieve-

(Continued at the foot of next page.)

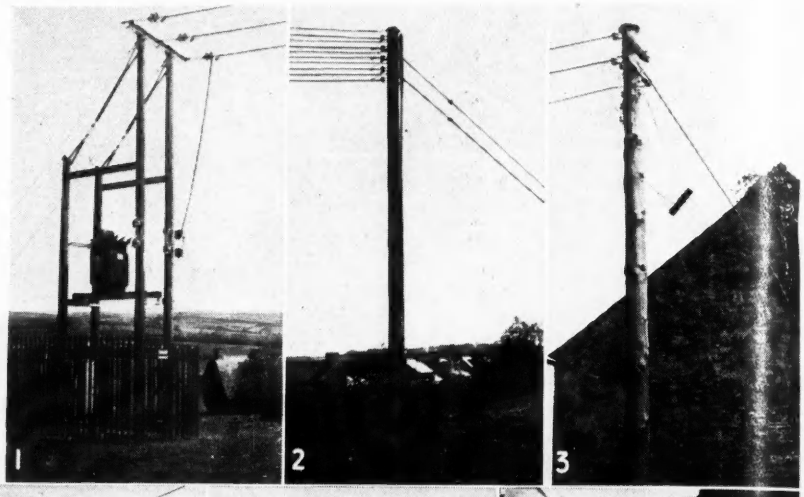
Distribution in Villages.

By John McCombe, Ph.D., A.M.I.E.E.

The influence of high-voltage transmission

THOSE engaged on change-over work in rural areas cannot fail to appreciate what the grid has done towards improving construction in low-voltage distribution in Northern Ireland.

In general the distribution in rural towns is by wood poles erected in the streets. The conductors are principally of solid copper and the poles are from trees felled and dressed locally. The methods of fixing the conductors to the insulators are often rough and insecure. No impregnation of the poles with creosote or other preservative has been carried out, with the result that after a few years' service rotting commences at the ground level. Often at the time of change-over many of the poles are almost rotted through. Staying arrangements are seldom employed, while conductor sags and tensions are entirely ignored and consequently all terminal and angle poles have permanent bends through undue loading.



Improving a rural distribution system. 1. New a.c. supply from transformer after change-over. 2. New a.c. double-circuit terminal pole. 3. Existing d.c. supply before change-over. 4. Four-way section pole. 5. D.c. double-circuit terminal pole before change-over. 6. Existing and new l.v. poles. 7. Under-eaves wiring.

The services to consumers have been crudely and inefficiently carried out, while metering and attendant wiring are slip-shod. In many instances a large number of services have been taken off a single span between two pole positions. Services fall with great frequency, while a mild wind or snowstorm cuts off the supply for several days.

With the advent of a rural transmission scheme and its consequent development of domestic loads for cooking, heating and power, the maintenance of supplies becomes the keynote. Construction has received an attention and a degree of standardisation not hitherto thought of.

Fig. 1 illustrates a rural transformer pole for a 200-kVA, 11,000/400-V transformer, the supply from which is taken out in duplicate by means of underground cable to the terminal pole of the low-voltage network as shown in fig. 2. This should be contrasted with fig. 3 which shows an existing d.c. supply with the leads coming from the generating station to the terminal pole of the low-voltage network.

The low-voltage four-way steel section pole shown in fig. 4 should be compared with that in fig. 5, which indicates a typical d.c. section pole before change-over. Angle poles erected before and after change-over are illustrated in fig. 6. In most rural towns and villages poles have been dispensed with in the streets and the distributors are erected under the eaves as shown in fig. 7.

Street lighting has improved beyond recognition. Two-three- and four-way reflectors have been properly exploited, while the height and positions of the lamps to give the maximum illumination have also received the necessary attention. Metering and meter board arrangements have been standardised, a typical arrangement being that shown in fig. 8.

Die Castings (*Concluded from previous page*)

ment in die casting. Further developments are expected when the special requirements for casting magnesium become better understood by the die-casting trade.

On washing machines, where weight saving is of minor importance—since the machines, when moved, run on castors—zinc alloys find considerable use, *e.g.*, for gear cases, some of the gearing, wringer parts, brackets, handles and housings. Freedom from rusting is also an important consideration. Some sand castings are used, but chiefly by firms with existing foundry equipment. Washing-machine castings which are die-cast from zinc, could not be made from this or any other alloy in sand cast form with equal accuracy in sections so thin and requiring so little machining. Stamped steel wringer frames are made, but require a larger investment in dies and in plating equipment.

Progress of Madras Schemes

The improvement in conditions brought about by the extension of electric power in the Madras Presidency having justified the policy of the Government, further additions to the Pykara hydro-electric scheme and the development of new projects are now in hand. The second stage of the Pykara scheme comprises the construction of the Mukurti Dam to store the waters of the Mukurti basin, and as this is practically complete the work of providing additional units is in progress and is being hastened to meet the power supply demand from Trichinopoly and Negapatam districts. The Mettur hydro-electric scheme has just started operation with one unit and the Vizagapatam and Bezwada thermal stations are in the course of construction. The estimates for the Papanasam hydro-electric scheme, amounting to nearly Rs.2 crores, have been completed. A scheme for pumping water from bore-holes for the famine-affected Ceded Districts is also contemplated.

Plastics for the Electrical Industry

By W. Blakey, M.A., Ph.D., A.I.C.

Selecting the most suitable for particular applications

THE field of plastics is extremely large and the range of plastic materials available very numerous so that the electrical engineer frequently has some difficulty in picking out the most suitable materials for his particular applications. In some Continental countries official classifications have been drawn up to simplify this problem and in Germany in particular the Verband Deutscher Elektrotechniker (V.D.E.) classification has now been universally accepted.

In this country the British Standard Specification No. 488, published in 1933, has proved of considerable value, but it is very limited in its scope and covers too small a range of materials. The British Standards Institution has recently circulated to the trade for comment a tentative specification for phenolic mouldings, and it is hoped that this will become a British Standard Specification before the end of the current year. In this case again, however, the range of materials covered is small compared with the whole field of plastics available to the electrical industry.

Plastics may be classified in many ways. The German V.D.E. divides them first by the method of working and subdivides the groups so obtained by thermal, mechanical and electrical properties. B.S.S. 488 classifies plastics solely by their thermal properties (plastic yield). In a very interesting paper* published last year Dunton & Caress gave a descriptive classification of plastics by dividing them according to their applications, again using the maximum temperature which the materials would withstand as the crucial factor.

For many purposes a classification according to chemical composition is to be preferred and such a method has been adopted in the grouped arrangement of types which is set out below.

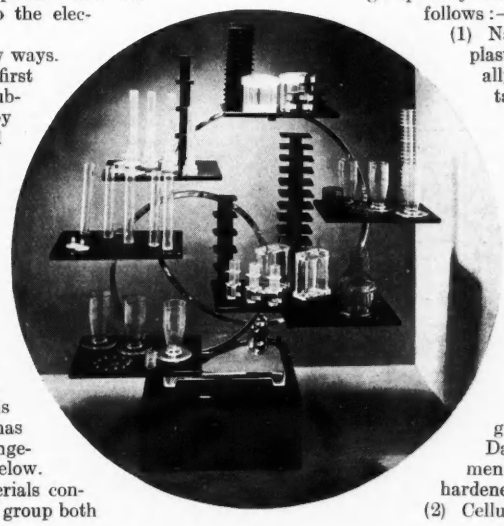
Most plastics are composite materials consisting of binder and filler. In one group both binder and filler are inorganic materials of mineral origin. The binders are usually cements or low-melting fluxes and the fillers mineral powders or fibres such as mica, asbestos, barytes, &c. There are two principal types:—(1) Hydraulic cements with asbestos fillers. These are usually "cold-moulding materials" which set in a manner similar to cement. They are used principally for arc-resisting mouldings. Typical examples are Paxbestos, Siluminite and Tenacit. (2) Lead borate with mica fillers is moulded at very high temperatures and used for heat-resisting low-loss mouldings. Examples are Mycalex and Tenacit.

Dr. William Blakey is chief chemist to British Industrial Plastics, Ltd.

The great bulk of plastics are based on organic binders, by which term is meant a compound of carbon, whether this is of animal or vegetable origin, or prepared synthetically. This group may be sub-divided into many types as follows:—

(1) Natural resins, which class includes plastics having as binder such naturally occurring materials as shellac, obtained from insects; copal and rosin, obtained from trees; bitumen (natural) and pitch (from coal); waxes of vegetable, animal and mineral origins. Examples of the application of these materials in the electrical industry are the preparation of battery boxes and meter cases and components containing many large inserts. Such materials may either be pressed hot into cold moulds (*e.g.*, battery boxes), hot moulded or cold moulded and hardened by baking. The last method gives the best electrical properties in this grade of material. Examples are Dagenite, Gummon, Telenduron (bitumen), Cetec (cold moulded and heat hardened).

(2) Cellulose derivatives.—By treatment of cellulose, that is vegetable fibre, usually in the form of bleached wood-pulp or cotton linters, with various chemicals a number of derivatives such as cellulose acetate, cellulose nitrate, ethyl cellulose and benzyl cellulose are obtained which form the basis of an important range of plastics. They are characterised by extreme toughness and flexibility. They may be compression moulded if the mould is afterwards chilled, but being thermoplastic, they are more conveniently worked by processes of injection or extrusion. They are particularly suitable for the rapid mass production of small parts which have not to withstand temperatures above 50 deg. C. and have the added advantage of great resistance to impact. Typical examples are Cellomold, Trolit, A. T. Cellulose, Bexoid, Crayonne and Erinofort.



Examples of transparent and black opaque mouldings made from cellulose acetate and styrol powders. (T. de la Rue & Co., and F. A. Hughes & Co.)

Examples of phenol-formaldehyde and urea-formaldehyde mouldings for small electrical accessories (Streetly Manufacturing Co.)

(3) Rubber compositions, which have been known for many years and need no description. They are principally used for normal temperature work, although some grades are suitable up to 50-60 deg. C. Examples are Belleroid and Keramot.

(4) Synthetic resins, most extensively utilised, are derived not from natural sources but from chemicals. These are of two general types: those which are thermoplastic and undergo no substantial chemical change during moulding, known usually as polymerisation products; and those which undergo a chemical change during moulding, so forming insoluble and irreversible final products, known as condensation products. There are a great many varieties under each heading.

Polymerisation products comprise the Vinyl resins, the Acrylic resins, Polystyrol and Cuma-

* I.E.E. *Journal*, Vol. 79, No. 478 (1936)

rone. The first three of these are employed for injection and extrusion moulding in all colours, polystyrol being particularly good for low-loss requirements. Cumarone resins are used mainly in lacquers and enamels. Examples are vinyl-Gelva, Alvar, Mipolam, Vinnapas, Vinylite, acrylic-Diakon, Perspex, Pontalite, polystyrol-Trolitul, Victron, Waterlite, Resoglaz, cumarone-Brofo and Cumar. All the products in this class are thermo-plastic and suitable only for moderate temperature work up to 50-60 deg. C.

Condensation products comprise: (*a*) Phenol-formaldehyde resins, which are prepared from phenol (carbolic acid) obtained from coal-tar and formaldehyde, the last-mentioned being a gas obtained from synthetic methyl alcohol and sold commercially as a 30-40 per cent. solution in water under the name formalin. (*b*) Urea-formaldehyde resins, which are prepared from urea (obtained synthetically from ammonia and carbon dioxide) and formalin. (*c*) Glyptal-type resins, which are prepared by the interaction of glycerine (obtained from fats) and phthalic acid (from coal-tar naphthalene) together with a variety of fatty acids and oils of vegetable and animal origins. There are many other condensation resins, but the bulk of the commercial grades fall under one of the above headings. Casein, the albumen acid contained in milk and prepared from dried skim-milk, may be regarded as falling in this class, as it is usually combined with formaldehyde when used as a plastic.

The phenol-formaldehyde and urea-formaldehyde types are, of course, the most important of all to the electrical industry. They have made possible the mass-production of complicated mouldings with an accuracy which could be obtained in no other way on such a scale. They are generally compression moulded, but can also be injected or extruded. They are thermo-setting and in general are suited to hot-service work up to 100 deg. C. and some grades can be used at higher temperatures. The urea type are to be preferred where there is any sparking between contacts or possible accumulation of dirt, owing to their complete resistance to tracking. They are also obligatory if a water-clear, white, or pale-coloured thermo-setting material is required. Examples are (phenol-formaldehyde) Bakelite, Rockite, Mouldrite P.F., Elo; and (urea-formaldehyde) Beetle, Pollopas, Scarab, Mouldrite U.F., Mouldrite W.F.

In addition to the moulding materials made from urea-formaldehyde and phenol-formaldehyde there are also many

(*Continued at foot of next page.*)

Composition.	Moulding Method.	Colour.	Transparency.	Specific Gravity.	Cross-breaking Strength lb. sq. in.	Inflammability.	Type of Service for which suitable.	Applications and Remarks.	Examples.
Hydraulic cements with mineral fillers	Cold setting...	Grey ...	Opaque ...	2–4	2,400	Arc-resisting	Very high temperature	Circuit-breakers, switchgear	Paxbestos, Silminite, Tenacit
Lead borate and mica	High temperature fusion (500° C.)	Grey ...	Opaque ...	3	9,300	Non-inflammable	High temp. (up to 450°C.)	Specially suitable for low-loss work at high temps.	Mycalex, Tenacit
Natural resin and mineral fillers	Various ...	Brown, grey or black	Opaque ...	Various	Various	Inflammable, except in the heavily loaded grades	Mainly normal temp. but some grades are thermo-hardening and suitable for use up to 100° C.	Battery boxes, meter-cases, switch-plates, mouldings with heavy inserts	Dagenite, Gummon, Trilenduron, Cetec
Cellulose derivatives	Injection, extrusion or compression with cooling	Unlimited range	Transparent, translucent and opaque	1.3–1.6	7,000–8,000	Inflammable in varying degrees	Moderate temps. (up to 50° C.)	Small parts, complicated shapes, lamp-shades, transparent covers	Cellomold, Bexoid, Crayonne, Erinofort, Trolit, A.T. Cellulose
Rubber compositions	Compression	Black, brown, red	Opaque ...	1.1–1.4	—	Inflammable	Moderate temps. (up to 60° C.)	Parts requiring high resistance to impact or to moisture	Belleroid, Keramot
Polymerisation Products:									
Vinyl	Injection, extrusion or compression with cooling	Unlimited range	Transparent, translucent and opaque	1.3	10,000–15,000	Inflammable	Moderate temps. (up to 70° C.)	Extruded rods, etc., for assemblies	Alvar, Mipolam, Vinnapas
Acrylic	,,	,,	,,	1.2	10,000–15,000	Inflammable	,,	Principally for transparent effects	Diakon, Pontalite
Styrol	,,	,,		1.05	6,000–7,000	Very inflammable	,,	Low-loss work ...	Trolitul, Victron, Waterlite, Resoglaz
Condensation Products:									
(*a*) Phenol-formaldehyde (including cresol-formaldehyde) Wood-filled ...	Compression, occasionally injection or extrusion	Multi-coloured (dark shades)	Opaque ...	1.3–1.5	9,000–11,000	Inflammable but not readily so	Hot service: up to 140° C.	Very wide—only serious limitation is tendency to electrical tracking	Bakelite, Rockite, Mouldrite P.F., Elo
Mineral-filled ...	,,	,,	Opaque ...	1.8–2.0	7,000–11,000	,,	Up to 250° C....	,,	,,
Fabric-filled ...	,,	Brown ...	Opaque ...	1.4	8,000–12,000	,,	Up to 140° C....	,,	,,
Cast Resin ...	Cast ...	All but water clear	Transparent	1.3	—	,,	Moderate temp. –60° C.	Mainly decorative...	Catalin, Trolone, Marblette
Laminated (paper)	Hot-pressed	All but white	Opaque ...	1.2–1.4	88,000–20,000	,,	Hot service – (to 100° C.)	Very wide use for all types of components	Bakelite, Tufnol, Miocarta
,, (fabric)	,,	Brown	Opaque	1.3–1.4	15,000–20,000	,,			
(*b*) Urea-formaldehyde (including thiourea formaldehyde):									
Paper-filled ...	Compression, injection or extrusion	Unlimited range	Translucent and opaque	1.5–1.7	13,000–16,000	Almost completely non-inflammable	Hot service: up to 100°–110°C.	Very wide—available in white and cream, completely non-tracking	Beetle Pollopas, Mouldrite U.F., Scarab, Mouldrite WF
Wood-filled ...	,,	,,	Opaque	1.5–1.7	13,000–16,000				
Unfilled (moulded)	,,	Water clear and all colours	Transparent	1.425	—	,,	Up to 70° C....	For transparent effects	Beetle transparent
,, (cast) ...	Cast ...	,,	,,	1.4	—	,,	—	Decorative	Prystal
Laminated (paper)	Hot-pressed	Unlimited range	Translucent and opaque	1.5–1.6	20,000–25,000	,,	Up to 50°C. ...	Non-tracking laminated parts and decorative	Beetle, Bakelite, Traffolyte
(*c*) Glyptal type resins for baking enamels	—	Pale yellow to dark brown	Transparent	1.1–1.4	—	Inflammable	Some types suitable for very high temps.	Incorporation in baking enamels	Paralac, Rezyl, Alkydal, Beckacite
Resins for mica-bonding and resin-bonded mica	Compression	Yellow to brown	Transparent	1.1–1.4	—	Inflammable	Heat-resisting	Bonded mica for dielectric use	Micanite Glyptanite
Casein	Usually shaped hot or cut and turned	Unlimited range	Transparent, translucent and opaque	1.35	—	Almost completely non-inflammable	Moderate temp.	Mainly for small parts which can be readily cut or machined—good mechanically—attractive effects possible	Erinoid, Lactoid, Galalith, Egolith

The s.s. "Orcades"

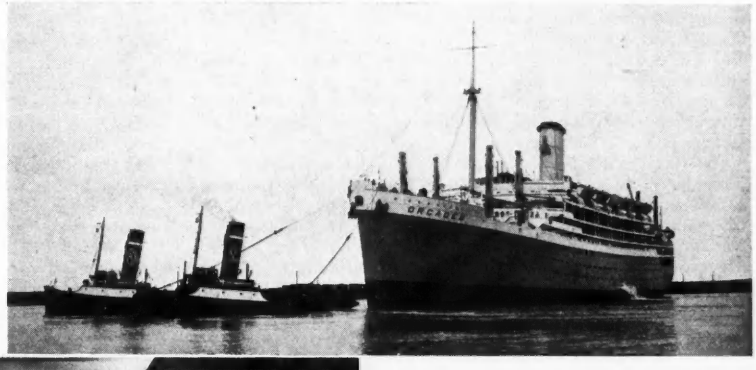
Electrical equipment of the latest Orient liner

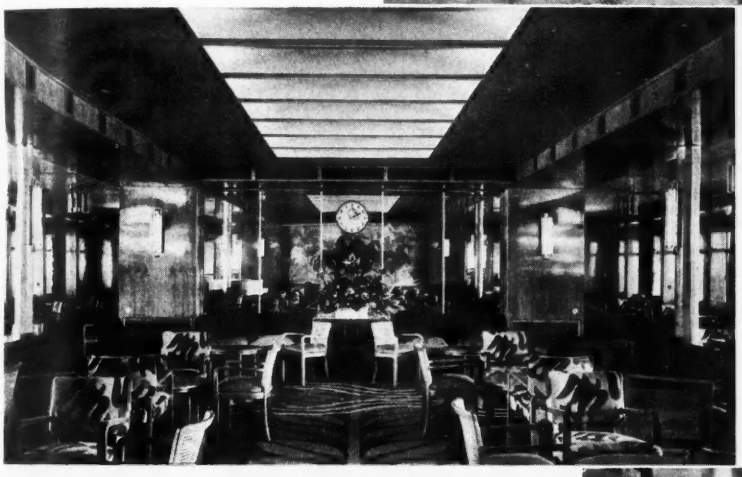
A NOTABLE addition to the large passenger ships of Great Britain was made on Saturday last when the Orient liner *Orcades* started on her maiden voyage. The new vessel—an eightdecker—has been built at Barrow by Vickers Armstrongs for cruises and for service on routes between England and Australia. Its gross tonnage is 23,445, and its overall length and breadth 665 ft. and 84 ft. It will accommodate 463 first-class and 605 tourist passengers and is worked by a crew of 466 hands.

The *Orcades* (the middle syllable is short) is a sister ship of the *Orion* which was put into commission two years ago, but it embodies a number of improvements that have suggested themselves in the intervening period.

During a trip we made on the *Orcades* the only point we found for adverse comment was that the liner is not electrically propelled. That criticism out of the way, it can be said that the electrical equipment is on a par with the other excellent features of the vessel.

Two sets of 1,715-r.p.m. Parsons turbines drive the propellers at 112 r.p.m. through Vickers Bostock-Bramley single-reduction gearing, the combined s.h.p. being 24,000. Each unit comprises an impulse-reaction-h.p. turbine and reaction i.p. and l.p. turbines driving separate pinions engaging with the main gear wheel. The astern turbines with h.p. and l.p. cylinders in series give about 70 per cent. of the ahead power. Electrically operated turning gear is provided. The main "regenerative" condensers (suspended from the l.p. cas-



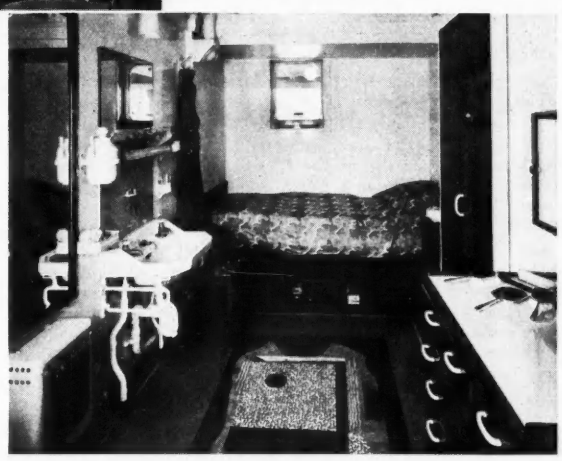


The new liner (top), 1st class lounge (centre) and a 1st class single-berth cabin

ings and fitted with spring supports) have a total cooling surface of 25,000 sq. ft. and maintain a vacuum of 28 in. h.g., with bar. 30 in. and sea water at 86 deg. F.

Steam is provided by six oil-fired Babcock & Wilcox boilers at 450 lb. per sq. in. (blow-off) and 725 deg. F. Four of these have a total generating surface of 29,860 sq. ft. and the other two 7,170 sq. ft. Forced draught with a closed air duct system with open stokeholds is employed in conjunction with five Howden double-inlet fans driven by Allen motors. The oil-fuel installation consists of four units, each comprising one pump and one heater. Crockatt salinometers are provided. Tubular air heaters are fitted. Electricity is generated by three 5,000-r.p.m. impulse turbines driving 550-kW, d.c., 220-V compound generators at 500 r.p.m. through double-helical gears and in emergency by a six-cylinder four-cycle airless-injection oil engine directly coupled to a 90-kW, 500-r.p.m. generator. These sets were all constructed by W. H. Allen, Sons & Co., Ltd. The turbo-generators are installed in a compartment above the main engine room and operate under steam conditions of 400 lb. per sq. in. and 725 deg. F. They exhaust against a back-pressure of 8 lb. per sq. in. or to a vacuum of 25 in. when in port. Steam is bled from each turbine for feed heating. The emergency oil engine set (in a separate compartment forward) is started by compressed air for which a Lister Hamworthy compressor has been provided. The self-contained jacket-water radiator is cooled by a fan driven off an extension of the generator shaft.

The main switchboard is divided into three sections each fed by one generator through a 2,500-A t.p. circuit-breaker with overload and reverse-current trips. The port and starboard sections also accommodate d.p. overload circuit-breakers controlling feeders to eighteen auxiliary switchboards throughout the ship and also various lighting and power circuits. The mid-ship section is used for paralleling the generators and is connected to the others by copper busbars carried on insulators in the beam spaces overhead. Auxiliary switchboards at different points on the system are in port and starboard sections, corresponding to the similar sections of the main switchboard. They can be supplied independently or paralleled, but in the latter case one of the main supplies is isolated. All the switchboards are of Whipp & Bourne's manufacture except that in the emergency dynamo room, which is made by W. H. Allen, Sons & Co. The latter, which serves several independent emergency circuits, can be supplied from or give a supply to the main switchboard.



Plastics (*Concluded from previous page*)

cast resin and laminated materials based on these plastics. The cast resins are mainly used for decorative effects. Examples are Catalin, Trolon and Marblette. Laminated plastics find a multitude of uses for electrical parts of all kinds. Examples are Bettle, Bakelite, Tufnol, Trolitax, Traffolyte.

The glyptal-type resins are mainly used for the preparation of baking enamels and for the bonding of mica. Examples are Paralac, Alkydal, Rezyl, Beckacite, Albertalate (lacquer resins) and Micanite, Glyptanite (resin-bonded mica).

Casein is used mainly for small parts which can readily be cut or machined. It is characterised by very good mechanical strength and attractive colourings. Examples are Erinoid, Egolith, Lactoid, Galalith and Akalit.

The accompanying table sets out in abbreviated form the principal types of plastics on the market, together with a few of their general properties and applications.

Allens have also provided two single-stage 130-b.h.p., 4,250-r.p.m. steam turbines driving through speed-reduction gears circulating-water pumps for the main condensers each with a duty of 16,000 gal. per min. against a total head of 21 ft. at 425 r.p.m. The turbines exhaust against a back pressure of 8 lb. per sq. in. gauge. Electric motors are used for driving other pumps such as those for sanitary, bath, refrigerating, and air-conditioning services, as well as more than seventy with controllers for many other auxiliaries constructed by the same firm. Deck machinery includes two windlasses and capstans forward, two capstans aft and twelve cargo winches forward, of the "Gilbert-Austin" type manufactured by Napier Bros., each unit having control gear capable of giving infinitely variable speed in both directions of rotation. Twelve self-contained cargo winches aft were supplied by the Metropolitan-Vickers Electrical Co. There are also eighteen Welin-McLachlan boat hoists. The electrically operated watertight doors of Stone's manufacture can be controlled either locally or from the bridge.

Brown's electro-hydraulic steering gear is provided with telemotor control from the navigating bridge; it is driven by two 50-h.p., 600-r.p.m. motors supplied from either the port or starboard main switchboard. A Sperry two-unit, 220-V gyro pilot and Evershed & Vignoles engine speed and direction indicators are employed. In the cook's galley electricity is used for baking and pastry ovens, grills, toasters, fish fryers, together with various culinary machines, the apparatus being generally of Henry Wilson's manufacture.

The total heat-insulated cargo capacity is 212,000 cu. ft. in three holds and between the decks forward. There is also 17,500 cu. ft. of provision chambers, eleven large cupboards in the galleys and lower bars with three water coolers. Refrigerating plant supplied by J. & E. Hall and driven by Allen motors includes three horizontal twin-compressor 125-h.p. CO_2 machines, four 8-h.p. brine pumps, two 16½-h.p. seawater pumps, two 12-h.p. fresh-water pumps, and ten Davidson "Aeroto" fans.

Fifty-six resistance thermometers are fitted in the insulated holds and in some of the cold stores. These are connected to a 36-way indicator for the former and to a 24-way indicator for the latter, both situated in the compressor room. Each indicator receives its current from a 4.5-V dry battery. This system was supplied by the Cambridge Instrument Co.

A fourth compressor of the same size has been installed for supplying cold water to the Carrier air-conditioning plant and one of the cargo units can also be transferred to the same duty.

It is claimed that the *Orcades* is the first British ship on the Suez route to have a public sitting room supplied with conditioned air. The library is an excellent example, even in this climate, of the practical value of the system. The first-class dining saloon with its two private annexes is another. There are also two self-contained flats, four large staterooms and six inside cabins without portholes equipped in the same way. Some 300 h.p. of motors is used in connection with the system of Thermotank ventilation provided elsewhere to supplement the ordinary punkah-louvres. In addition to the Thermotank system of air heating, lamp-pattern electric fires by Wm. McGeoch and tubular radiators by Unity Heating are installed in public and private rooms.

Illumination is carried out by concealed, box-type and decorative fittings. Ivory Roanoid fittings by the General Electric Co. are used throughout the staterooms. Public rooms are lighted by laylights and decorative fittings manufactured by the G.E.C. and Wm. McGeoch. The general illumination provided is soft and pleasing, but at the same time the foot candles are ample to enable small print to be read easily at any point at which we tested the values. The lighting installation and the provision made for connecting portable apparatus have involved the installation of almost literally uncountable tumbler switches and switch sockets of Crabtree construction. For lighting the sports deck and swimming baths 300-W "Duoflux" fittings are employed, while 500-W B.T.H. floodlights are arranged to illuminate the funnel at night. At the bow of the vessel is a Clarke, Chapman 20-in. Suez Canal projector.

For operating the low-voltage circuits for signals, alarms and navigation telephones two storage batteries are provided, each containing eleven Exide cells, 128-Ah at the ten-hour discharge rate. Call-bell indicators by Wm. McGeoch are installed to be operated from all rooms and loud-speaking navigation telephones by the Telephone Manufacturing Co. provide communication between the bridge, engine room and other important points.

A switch in the wheelhouse sets in action the Gent system of alarm gongs, while G.E.C. alarm pushes and telephone jacks give warning on the bridge in the case of fire, and Mather & Platt sprinkler alarms indicate its location. Two systems of intercommunication telephones by the Telephone Manufacturing Co. are installed, each with two sets of three 45-Ah cells, one for ringing and the other for the sparking circuits. An all-wave radio installation, including a direction finder, and an "Echometer" depth sounder have been installed by the Marconi International Marine Communication Co., together with a broadcast system of loudspeakers throughout the vessel. Time is given by means of eighty-two synchronous clocks manufactured by Everett, Edgcumbe & Co.

A portable sound picture equipment by the Western Electric Co. is one of the many forms of entertainment provided.

Finally, special attention appears to have been given to providing against an outbreak of fire, and in addition to the systems mentioned above the Walter Kidde Co. have provided a Rich fire-detecting system for the holds.

Correspondence

Contributions from readers are welcomed. The writer should give his name and address, not necessarily for publication

Declaring More Than One Voltage

I should be grateful for information as to whether any supply authorities at home or abroad declare different mains voltages to groups of consumers on long low-voltage distributors in order to allow for voltage drop where no regulating devices are installed. For example, the nominal voltage at the feeding end could be 250 and at the remote end 230, thus permitting a voltage gradient from about 260 to 220 with a permissible variation of about ± 5 per cent.

The licences of some undertakings abroad, beyond stating that the voltage must be declared, give no specific figure, and at present legislation imposes no restriction. Provided, therefore, that the standard rated voltages of lamps and apparatus were kept in mind, it would seem, in certain circumstances, economical and convenient to declare more than one voltage.

August 18th. BIJLI.

Irish Railway Station Lighting

Fahan railway station, on the Londonderry and Lough Swilly Railway, was lighted by electricity in the winter of the year 1885, and I am anxious to know whether this was the first Irish railway station to be lighted electrically.

It may be a subject for wonder that an out-of-the-way station like Fahan should hold such a record. The explanation is that the stationmaster, Mr. James Bond (who afterwards became a science teacher) had a talent for scientific experiment. On his own initiative he got together the necessary plant, which was driven by a windmill. H. P. SWAN.

Buncrana, I.F.S., *August 20th.*

Cooking Utensils

My letter in your issue of August 6th seems to have left Mr. T. N. Veitch under the impression that I was comparing the iron saucepan with the ordinary aluminium one. I assure him I was not. I was comparing the iron saucepan with the heavy aluminium one. When I say I get better results with the old-fashioned flat-bottom iron saucepan I speak with four points in mind: *viz.*, initial cost, time of heating, wear and tear, and duration of service.

I find the use of the iron utensil in preference to the heavy aluminium one to be far from killing enthusiasm for electric cooking—the opposite is the result. Neither is it a "means of getting over a difficulty by a temporary expedient without troubling about the future consequences." I will give two examples:—(A) My own case. I have had four flat-bottom iron saucepans in use regularly for over five years on my own cooker. Both the cooker and the saucepans are giving excellent results, and there is no sign of deterioration of either the cooker or the saucepans. Now I think Mr. Veitch must agree this is a very fair test. (B) One of my customers hired an electric cooker together with the heavy aluminium utensils, but as she found the cost of using them, together with the hire charges, was high I gave her the tip *re* the iron saucepans. She gave them a trial, and after two months returned her hired heavy aluminium saucepans to the electricity undertaking. That was over two years ago. A recent examination of the cooker and utensils showed no deterioration of either, and my customer assures me they have been in regular use.

Mr. Veitch states that a utensil must comply with the law

governing expansion and contraction, also that the thickness of the sides must be in relation to the thickness of the bottom. But the old-fashioned iron saucepan was made to meet these requirements, and in addition was made to stand very hard blows (people have been known to use them as hammers).

Working class people, who are the biggest consumers of gas for cooking, have to study their pocket. With the growth of the all-in tariff they are taking increasing interest in electric cooking. The old-fashioned iron saucepan has been, and is now, very popular with them for all purposes. I find that when they are told they can use the same iron saucepans they take far more readily to electric cooking than they otherwise would.

H. S. TRINDER.

Earlsfield, S.W.18, *August 17th.*

Engineering Status

Permit me to refer to the editorial comment with the heading "What's in a Name?" which appeared in your issue of August 20th, and to say that my Association wholeheartedly supports the points stressed, *viz.*: (*a*) The real significance of an adequate status. (*b*) Public recognition of the qualifications required of an engineer. (*c*) Pride in the use of the simple title engineer.

(*a*) largely follows on (*b*), to achieve which it is essential for the public to be better informed than at present of the important role the engineer fulfils in modern society, how its very existence is the result of achievements of engineering science, that its health, happiness and convenience are dependent very largely on engineers, and that it is a matter of importance that those who fulfil such an essential place in society should have adequate qualifications.

Engineering has been defined as the "art of directing the great sources of power in nature for the use and convenience of men," and, obviously, the engineer is one who practises the art. By inference, the art requires a knowledge of science and mathematics and, what is often forgotten, an understanding of economic and social conditions and reactions.

The word "engineer" did not confuse, nor was the engineer flattered by the non-competent use of the title, directly or indirectly, until after the introduction of the steam engine. Since then the great advances made in applying "the great sources of power in nature" have so occupied engineers as to cause them to be wholly engrossed in the scientific and mathematical aspects of their work to the detriment of the social side and to their own position and status. The Association of which I have the honour to be secretary was formed to look after these professional interests hitherto so largely neglected.

The question of the registration of engineers has from time to time been revived and I trust that your comments will again cause engineers to consider their position in relation to other professions in this matter. My Association has always regarded registration as the one thing which, by requiring a definite qualification of those practising and calling themselves engineers, will ensure public recognition for the properly qualified.

Dublin, *August 24th.* J. G. CHARLETON.

Secretary, The Engineers' Association.

Symmetrical Component Theory. By G. W. Stubbings, B.Sc.

OF the many geometrical constructions which have been proposed for the determination of the symmetrical components of unbalanced three-phase vector systems without residue none perhaps is so interesting and suggestive as that shown in fig. 1. Here ABC is the three-phase vector triangle, and D is the mid-point of AC. On the median BD has been constructed a 30 deg. right-angled triangle BDE. Then CE and AE are vectors which represent respectively the positive and negative sequence components of the ABC system in magnitude and phase.

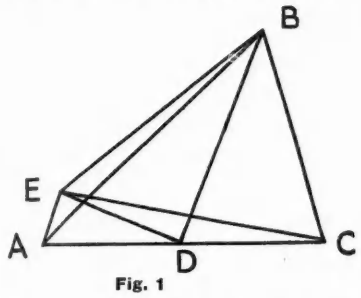


Fig. 1

The direct proof of this theorem is not very easy, but its truth may be perceived almost intuitively by the use of the idea of the symmetrical components of a two-phase system of vectors. A balanced three-phase voltage system represented graphically by an equilateral triangle will convert into a balanced two-phase system, in which phase voltages are equal to three-phase line voltages, by the well-known Scott transformer connection, in which a resultant median voltage on the three-phase side is increased in the ratio $2/\sqrt{3}$.

If the three-phase voltage system is unbalanced, then, according to symmetrical component theory, it may be regarded as compounded of two balanced components, the one of positive and the other of negative phase sequence. Each of these balanced components will be converted by the Scott transformer connection into a balanced two-phase system, and in these two balanced two-phase components the voltage derived from the median voltage of the three-phase unbalanced system will be lagging in one and leading in the other.

If the phase difference between two of the two-phase voltage vectors be increased by 90 deg. and the altered vectors are compounded, the positive sequence component will cancel and the resultant will be equal to twice the negative sequence component of the two-phase system, and, hence, to twice the negative sequence component of the three-phase system from which it has been derived. Similarly, by decreasing the phase difference of the two-phase voltage vectors by 90 deg., and compounding, the negative sequence component is eliminated, and the resultant is equal to twice the positive sequence component of the primary three-phase system.

Returning to fig. 1, it is readily seen that the line DE is equivalent to $1/\sqrt{3}$ times the median vector BD altered in phase by 90 deg. It therefore corresponds to one-half of one of the derived two-phase voltages with a 90 deg. phase modification. If this DE vector be combined with AD, which is one half of the other two-phase voltage, the resultant AE will give the negative sequence component of the derived two-phase system, and, hence, of the primary ABC system.

Similarly, EC represents the positive sequence component of the ABC system. The correctness of this construction is checked by the obvious consideration that if the ABC system is balanced, the negative sequence component is zero, and, further, by the circumstance that if the ABC system degenerates into a straight line and becomes single-phase, the positive and negative sequence components given become equal.

The practical application of this point of symmetrical component theory is found in the circuit illustrated in fig. 2 for the measurement of the positive and negative sequence voltages of a three-phase system. The impedance Z is non-inductive, and the condenser has an impedance numerically equal to $\sqrt{3}$ that of Z. The voltmeter which measures the component voltages is connected to the junction of the resistance and condenser and to a mid-point tap on an auto-transformer. It is evident that, provided the impedance of the voltmeter is negligible, the current in it corresponds to the vector EC in fig. 1. so that its indication will represent the positive sequence voltage. If the connection of the instrument is changed over

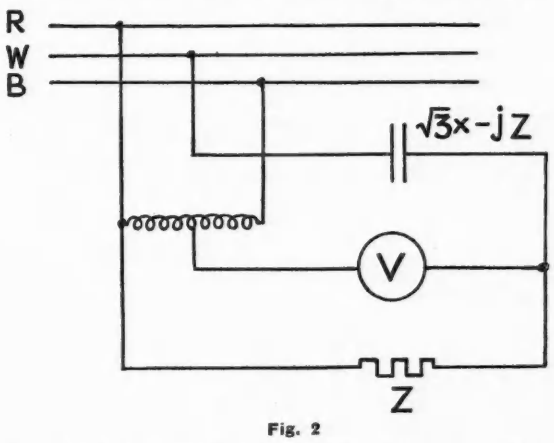


Fig. 2

from the R to the B line, its indication will correspond to the vector AE in fig. 1, and therefore, to the negative sequence voltage. If the voltmeter has appreciable impedance the current in it will no longer be in phase with the symmetrical component voltage which it indicates, but it is easy to show by simple analysis that this current will always be proportional to the positive or negative sequence voltage.

The practical advantage of the two-phase network for the measurement of the symmetrical component voltages of a three-phase system lies in the fact that the required phase difference of 90 deg. in the two impedances can be obtained without adjustment, and that this phase difference is independent of frequency. In a three-phase resolving network the required difference of 60 deg. in the phase angles of the impedances is obtained by special adjustment, and this phase difference as well as the impedance of the inductive branch of the network is altered by frequency variation.

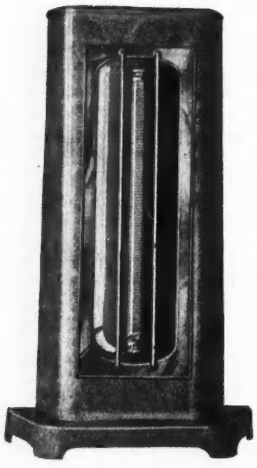
New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Domestic Apparatus

The introduction of several new domestic appliances is announced by FALK, STADELMANN & Co., LTD., 83-93, Farringdon Road, London, E.C.1.

An original and attractive brocade finish in gold, peacock or pink is used for a neat new "Sunlight" fire, which incorporates a rod-type element arranged vertically in a heavy gauge sheet metal casing with a cast base. Both 1- and 2-kW models are available.



The 1-kW "Sunlight" fire

For use either as a portable fire or on ceilings or walls of bathrooms, &c., an addition has been made to the "Sunray" range of reflector-type fires. The "B" model has cast-iron sides finished in cream and is fitted with a handle. It can be supplied with either 750- or 1,000-W elements.

Two new toasters also make their appearance — one low-priced yet stoutly built model fitted with a toast-rack on top and the other incorporating a radiant-type element and a device for turning the toast automatically. A radiant-type element is also employed in the new "Efesca-Surves" kettle.

Especially for use in flats, the "Flatlet" cooker can deal comfortably with the normal cooking requirements of the household and has a space provided underneath for keeping plates, &c., warm. Its oven, measuring 10½ in. by 12¼ in. by 12 in., is fitted with a 800-W plug-in type element. The 10-in. by 8-in. grill boiler is loaded at 2,000 W and is controlled by a three-heat switch.

The "Efesca-Perfection" vacuum cleaner has been produced to meet the demand for a light external bag-type machine. It has a powerful motor and its nozzle is adjustable for various thicknesses of carpet. A full set of attachments is available.

Sheathed-wire Immersion Heaters

The latest immersion type heaters, such as those used for converting fuel-fired hot water systems, to be introduced by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, are constructed according to a patented method of sheathing spirals. A split tube is first formed from metal strip and is lined with the refractory insulating material of the desired grade. The nickel chromium coil is placed in the groove so formed, and the remaining space is completely filled with compacted insulating material. The unit is then slipped into a copper tube, which is reduced in diameter until it grips the inner split tube, forming a solid rod element that can be bent to the required shape without displacing the coiled heater winding from the centre of the refractory insulating material. The completed rod elements are heated prior to the bending operation to anneal the copper sheath, the outside of which is afterwards cleaned for the dip tinning process.

Two bent and tinned elements are then assembled in a brass head, watertight joints being formed by the use of copper caulking rings and solder, and after a water pressure test at 50 lb. per sq. in. the terminal plate is fitted. This is built up on a mica-covered brass disc, and pillar type terminals are insulated by mica bushings. A moulded bakelite bridge piece forms a barrier between adjacent terminals and surrounds the central stud which serves as an earthing terminal. The element is subjected to an insulation test at 1,250 V r.m.s., 50 cycles, and also to a loading test. Finally a fibre sleeve with a brass cover encloses the terminal compartment.

New lighting fittings by Harcourts, Ltd. (top two), and the General Electric Co., Ltd.

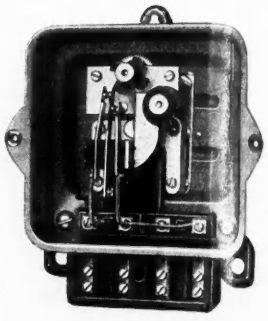
Electrical connections to the element are made through slots in the fibre sleeve, and the earth connection is made externally where the central stud passes through the brass cover.

These sheathed wire immersers are made in two sizes with loadings of 2 kW and 3 kW respectively and for all standard voltages up to 250.

A Motor-driven Contact Maker

The model "ASB" motor contact maker introduced by LONDEX, LTD., Brettenham House, Lancaster Place, London, W.C.2, consists of a self-starting a.c. motor with a high torque and low loading (2.8 W).

The switch spindle makes one revolution in six seconds when fitted with the standard gear. The four different spare cams supplied with the instrument give the following flashing intervals: 3-3, 1½-1½, 1-1, ¾-¾ sec. 6-A change-over contacts are fitted so that two circuits can be controlled.



The Londex motor-driven contact maker

This contact maker can be used for any signalling purpose, *e.g.*, controlling a reversing motor, advertising devices, traffic and railway signalling, call-repeaters and neon signs. The motor only, geared to 5-6 r.p.m., is supplied separately and is suitable for window display turntables and for all kinds of moving signs, while the contact maker can be operated in conjunction with special Londex relays.

A Window Fitting Fan

In our issue of August 13th, page 216, we stated that the "Vent-Axia" 9-in. window fitting fan was capable of extracting 22,000 cu. ft. of air per minute. This should have read per *hour*.

Inter-office Communication

An inter-room communication system known as the "Philcophone" has been introduced by the PHILCO RADIO & TELEVISION CPN. OF GREAT BRITAIN, LTD., Wadsworth Road, Perivale, Middlesex, and manufacture has now commenced in this country.

The units are built of standard Philco components and can be used on either a.c. or d.c. mains. The master unit is a compact walnut cabinet. Connection can be made with one or four stations simultaneously. A volume knob on the master unit sends or receives the voice as loud or as low as is desired. A red signal light shows when the system is in operation.

The remote unit provides two-way communication with the master unit. The speaker need not interrupt his work either to speak into or listen to the "Philcophone." It transmits the lowest tones and can be amplified so that the voice is audible throughout a large room. The loading is 45 W, and the apparatus lends itself particularly to applications in restaurants, offices, hospitals, hotels and factories.

A Radio Convertor

A new product of PHILIPS LAMPS, LTD., 145, Charing Cross Road, London, W.C.1, is a neat d.c. to a.c. convertor, enabling a.c. receivers to operate in the normal way on d.c. mains. The convertor consists of two sections. One houses the vibrator element and in the other are the various filters necessary to eliminate noise and interference. The action of the vibrator is to "chop up" the d.c. and apply it *via* filters to a special transformer which produces interrupted current of the correct voltage. Radio receivers equipped with these convertors can be used subsequently on a.c. supplies by means of a simple change-over adjustment.

The 1937-38 Lighting Season

Details of publicity schemes

ELECTRIC lamp manufacturers are anticipating more business than ever during the forthcoming lighting season and are determined that there shall be no dearth of attractive publicity materials and other sales aids. At little or no cost dealers can ensure that their showrooms and windows will look their best this winter and give maximum assistance in promoting sales. There are numerous novelties available and a full quota of catalogues, leaflets, &c., many of which are arranged for overprinting.

Following its successful initiation last autumn the E.D.A.-E.L.M.A. "Better Light—Better Sight" campaign is to be continued. Full details of this season's plans have not yet been made public, but we understand that a feature will be made of "light measurement." Two more E.L.M.A. members, Philips Lamps, Ltd., and Crompton Parkinson, Ltd., have now joined the six (G.E.C., B.T.H., Siemens, Metro-Vick, Ediswan and Cryselco) who participated in the 1936-37 campaign and were responsible for the expenditure incurred.

With this campaign in mind the now well-known "Man of Vision" again points out the value of better lighting to preserve eyesight and also the saving to be effected by using "Cosmos" lamps. The makers, the METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester, suggest that dealers should also show themselves "Men of Vision" by taking full advantage of the improved quality of the publicity materials.

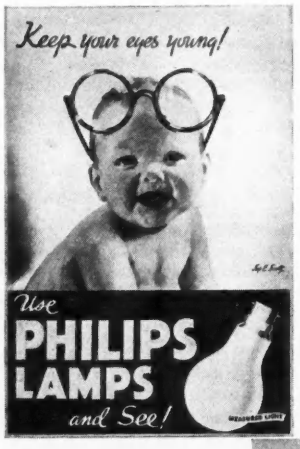
An 11 in. by 15 in. box sign using translucent embossed lettering is one of the most effective of these, a pleasing yet simple colour changing effect being incorporated. A flickering light is used on the moulded head of the "Man of Vision" in a new window display, the words "Cosmos Lamps" appearing in bright translucent letters. Supplied in a case, the display opens out to either 3 ft. 6 in. by 2 ft. or 3 ft. 6 in. by 4 ft. The "type B" display, also easily collapsible, is finished in gold metal, orange, black and white, and measures 2 ft. by 1 ft.

Apart from various showcards, catalogues, price lists, &c., relating to standard, electric-discharge, "Shrine" and "Remembrance" lamps, there are available calendars, the "Playtime Booklet for Children," bakelite holders for leaflets and other novelties. Booklet E.S. 4102/20, which is supplied overprinted, suggests improvements to existing installations and gives ideas of lighting new houses.

PHILIPS LAMPS, LTD., 145, Charing Cross Road, W.C.2, have brought out a large poster in fourteen colours, depicting a baby with the slogan "Keep your eyes young. Use Philips lamps and see." This will be displayed in all the big towns in the provinces during the thirteen weeks starting in the middle of September, and well printed 60 in. by 40 in. and 20 in. by 30 in. reproductions will enable dealers to participate in the campaign. Another 20 in. by 40 in. poster is also available for sticking on the inside of windows; it makes a feature of "measured light."

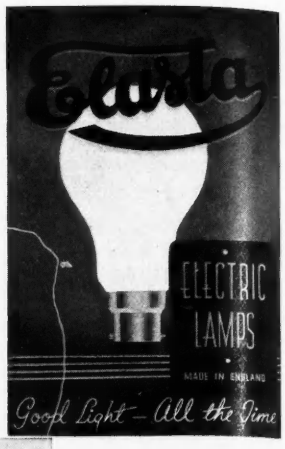
Philips lamp retailers will welcome a novel counter display on which prospective customers are invited to press button switches and compare the merits of clear, pearl and "Argenta" lamps. The centre portion of the display, upon which appears the words "Use

A selection of new publicity materials and sales aids



Philips lamps and see" is a transparency permanently illuminated, while on both side are slots to hold literature. The display is attractively finished in black, red, green and cream, edged with silver moulding. A new general catalogue contains complete details of all lamps manufactured.

The special publicity materials for automobile lamps, including leaflets for overprinting, point out that "Philips high-efficiency motor bulbs should be used for safety after dark."



Once more "Osram —The Wonderful Lamp" will be the "war-cry" of the GENERAL ELECTRIC Co., LTD., Magnet House, Kingsway, W.C.2, who, besides extensive national Press advertising, will have brightly coloured posters in 16- or 8-sheet sizes all over the country. The literature available to the trade includes wall and window showcards, cut-outs for window and counter display, and illuminated window displays. Among various sales literature is a 64-page thumb-indexed catalogue showing the various colours in which "Osram" lamps are made, and giving particulars of "Osira" electric-discharge lamps and floodlighting and street lighting equipment.

A new type of publication available for overprinting is a coloured fascimile of the well-known "Osram" lamp carton arranged to open in book form and showing the prices of popular types. A counter stand container is provided for exhibiting these.

"O for an Osram" should prove a successful new slogan. Besides appearing in an artistic 30 by 20 in. window sign, it is used in new illuminated window displays which have as a centre-piece a watchful looking owl, the eye of which is arranged as a large illuminated "O." These displays can be

Philips, Britannia, Aurora and Pope's display pieces

had in two sizes. A comprehensive trade "broadside" gives complete details of the new season's plans and includes references to shop, automobile and decorative lighting.

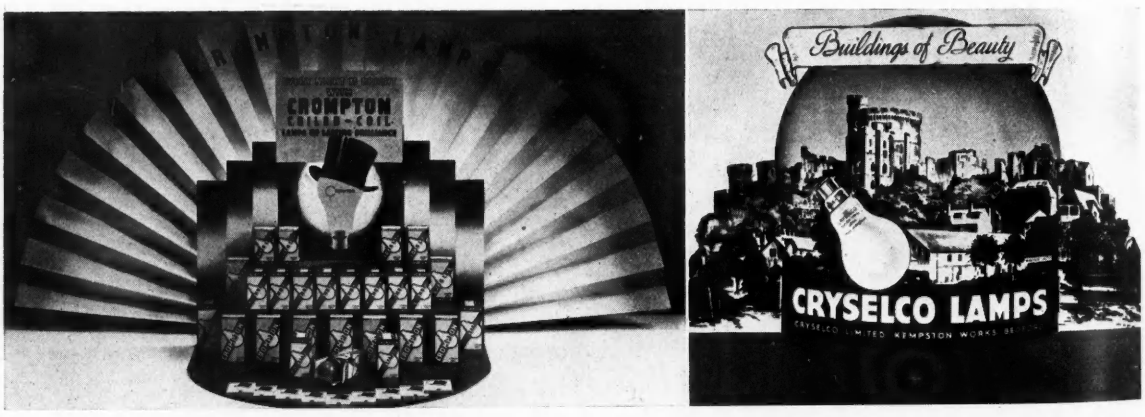
All the new publicity materials of CRYSELCO LTD., Kempston Works, Bedford, have Windsor Castle with the words "Buildings of Beauty" and "Beautifully Built" as the predominant feature. Full particulars and prices of general and automobile lamps appear on the back of two striking showcards, the colouring of which, similar to that employed for a display piece and a calendar, is particularly effective. A lamp behind the front portion of the display piece illuminates the windows of the buildings and at the same time makes a bright glow in the sky background. A small display card has nails for hanging.

The quality of their products is the feature stressed by the publicity of SIEMENS ELECTRIC LAMPS & SUPPLIES, LTD., 38-39, Upper Thames St., London, E.C.4, whose arresting new window display once more incorporates a realistic model of Big Ben, 50 in. in height. Behind a large display card in seven colours bearing the lettering: "Siemens Electric Lamps—Used for lighting Big Ben and just as reliable" is placed a lamp arranged so as to flood the whole tower with light and simultaneously illuminate the clock face and the word "Siemens" in the front with a rich orange glow.

In addition to a new showcard depicting a large pearl lamp with the words "Brighter and Better," Siemens are providing a counter cut-out in seven colours, featuring an owl cut to shape, with a pearl lamp carton and lamp in front forming a box for holding price lists. The company's plans also include extensive national, provincial and trade Press advertising.

An illuminated "Mazda" cut-out of simple yet striking design in green and yellow, measuring 35 in. high by 22½ in. wide, has been produced by the BRITISH THOMSON-HOUSTON Co., LTD., Crown House, Aldwych, W.C.2, and makes an admirable centre-piece for shop window use. Featuring the "type B" lamp, another display piece, 31 in. wide by 27 in. high, is printed in orange and blue, the price of the lamp appearing in silhouette.

There has been a breakaway from convention in the general



Two of the attractive Crompton and Cryselco displays which will brighten many shop windows this autumn

"Mazda" showcard inasmuch as the width is greater than the depth (22 in. wide, 9½ in. high). This card, together with another advertising motor-car bulbs, is fitted with a combined strut and hanger.

The new "Mazda" lamp catalogue conveniently thumb-indexed has been enlarged to fifty-six pages and has a coloured section devoted to decorative lamps, including the "Mazda Mickey Mouse" type, of which a large sale is expected.

Business and Industrial Notes

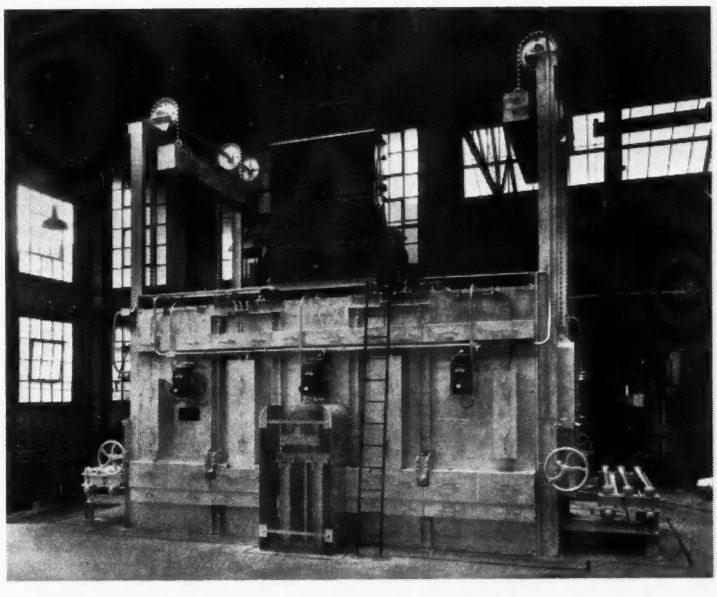
The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

A Lamp Factory at Blackburn

A scheme is in hand for the erection of a factory at Little Harwood, Blackburn, for Philips Lamps, Ltd., of Holland. The site is of thirty-two acres, and it is hoped that part of the new factory will be ready for operation in May next. It is anticipated that work will be found for about 5,000 operatives.

An Electric Furnace Installation

G. W. B. Electric Furnaces, Ltd., have recently installed a large continuous electric annealing furnace in the works of High Duty Alloys, Ltd., of Slough, for the heating of aluminium alloy billets prior to forging, and for the heat-treatment of light alloy structures. The furnace, which is of the roller hearth type and which is double-ended, is suitable for normal operating temperatures up to 600 deg. C. and is arranged for connection to a 440-V, 50-cycle, three-phase supply, the element voltage being suitably reduced by means of transformers. The connected load is 192 kW, this being divided into three equal zones of 64 kW, and each zone is separately controlled by means of a millivoltmeter-pattern indicating automatic temperature controller. For the convenience of the operator, three indicating pyrometers are mounted on the side of the furnace, together with an arrangement of pilot lamps showing when the temperature is "high," "normal" or "low." Heating is effected by 80/20 nickel chromium elements, wound in coils and supported by specially moulded refractories in the roof, hearth and side walls. The heating chamber is 16 ft. long by 7 ft. wide by 5 ft. high, and the billets are carried through the furnace on heat-resisting steel rollers mounted on external bearings fixed along each side of the casing. The rollers are provided with chain sprockets at each end and are roller-chain driven by electric motor through a suitable reduction gear. For heat-treatment purposes the furnace is provided with two patent centrifugal fans to accelerate heating-up and to ensure an even distribution of heat over the charge. This is the fourth and largest furnace of its type now in use in this particular factory and two more are in course of manufacture.



A. G.W.B. electric furnace at the works of High Duty Alloys, Ltd., Slough

Employment During July

According to the *Ministry of Labour Gazette* employment in the engineering industry during July improved slightly in some districts; in others it showed a slight decline, which was largely due to the incidence of local holidays. On the whole, taking all districts and all sections of the industry together, employment declined slightly, but remained good with much overtime and with some firms working night shifts. It was very good in electrical engineering. The total number out of work in the engineering industry rose from 53,907 in June to 58,633 in July, the percentage increasing from 5.1 to 5.5 (7.4 per cent. in July, 1936). In the electrical engineering section the number of unemployed was 3,018 (3,045 in June) or 3 per cent. (3.7 per cent. in July, 1936). The unemployed in the electrical wiring and contracting industry numbered 4,263 or 11.2 per cent. (10.3 per cent. in June and 13.1 per cent. in July, 1936). In the cables, apparatus, lamps, &c., group the unemployed numbered 6,653, the percentage falling slightly from 4.5 to 4.4; in July, 1936, 5.8 per cent. of those classified in this section were unemployed.

The 1937-38 Lighting Season (*Concluded from previous page*)

Tubular lamps, in particular the new alphabet series, are prominently listed, while the projector lamp section has been revised and extended and now includes the "Bipost" studio spotlight lamp. All the lamps contained in the main catalogue are listed in the "Mazda Lamp Business Guide," but without illustrations. This popular pocket reference book contains a handy table of discounts.

Among the new leaflets available may be mentioned the general lamp folder, an automobile lamp price list and a leaflet dealing with the alphabet series of light tubes. These are all available overprinted.

Last season's "hat" theme is to be retained by Crompton Parkinson, Ltd., but, to avoid losing force through excessive repetition, pairs of hats and lamps will be used to represent, for example, a schoolmaster and pupil. Extensive national and provincial newspaper advertising will be backed by the display all over the country of a 16-sheet coloured poster, and there will be a further link in the display material. One piece is designed to carry reproductions of the latest Press advertisements, while another, an adjustable background display, includes as a centre-piece an illustration of a lamp complete with top hat and monocle around which cartons are grouped.

The essentials of scientific lighting are outlined in two well-produced booklets, "The Crompton Book of Commercial Lighting" and "The Crompton Story of Seeing." An outdoor sign, two further displays, various showcards and leaflets complete the scheme, which is presented in an elaborate coloured brochure containing stand-up models of displays. For use in sickrooms, halls, &c., this company has recently introduced the new "High-Low" lamp which can be dimmed by operating a switch in the cap.

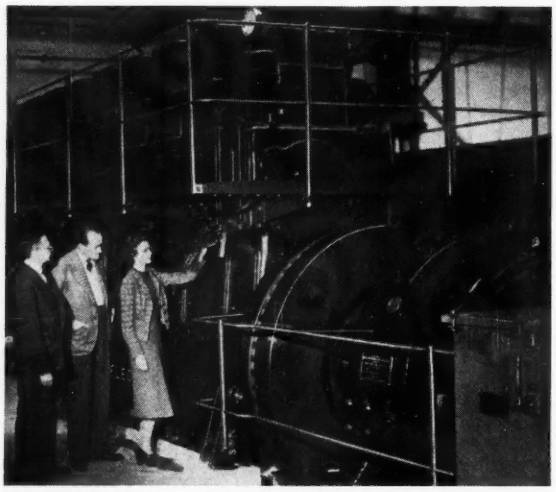
POPE'S ELECTRIC LAMP CO., LTD., whose new address owing to street renaming is 5, Earnshaw Street, New Oxford Street, London, W.C.2, has produced a comprehensive new "Elasta" lamp catalogue and a wide range of artistically designed sales promotion literature, together with price display wall cards, counter and window display material. Large stocks, coupled with speedy delivery service, are features of this company's trading policy.

To demonstrate the concentrated light given by its new "Excelsior" mirror reflector lamp the BRITANNIA ELECTRIC LAMP WORKS (1934), LTD., has produced a number of attractive showcases divided into two sections showing the extra light obtained for reading a book as compared with that from an ordinary lamp. The claim that the new lamp has an average life of 1,500 hours, gives 100 per cent. more concentrated light, and reduces electricity bills by half is stressed in an effective display piece. Brightly coloured new cartons have been designed both for the "Excelsior" and for the ordinary gas-filled lamps.

Claiming to be the only Scottish electric lamp manufacturers, AURORA LAMPS, LTD., Old Kilpatrick, have brought out a 2 ft. by 1 ft. 3 in. showcard in four sections which when assembled form the outline of a thistle. The background draws attention to the advantages of coiled-coil lamps and on each side is a replica of the "Aurora" carton with the company's trademark, the Scottish lion. A multi-coloured cockerel with the body in the shape of an electric lamp with the words "Cock o' the North" makes an appealing subject for the "Scotlite" type "B" showcard. Cut-outs, leaflets and varnished display cards for hanging or counter use are also available. Sales representatives are being equipped with light meters and other sales aids.

New Film Studio Plant

Since we described the electrical plant at the Pinewood film production studios at Iver Heath, Bucks, an additional Diesel engine of 1,000 h.p. has been installed to provide power for colour films. This, like the major part of the other power house equipment, was supplied by the English Electric Co., Ltd., and the total plant at this station now comprises five engines having the following outputs: One 300 h.p., three 750 h.p. and one 1,000 h.p. They are all direct-coupled to electric generators, having special features resulting in practically a ripple-free supply, which is necessary for film studio work.



The new 1,000-h.p. English Electric Diesel engine installed at Pinewood Studios

Our picture shows Miss Nova Pilbeam, with Capt. A. Norton, managing director of Pinewood Studios, and Mr. F. Hauser, chief electrical engineer, starting up the new 1,000-h.p. engine.

Wiring Installation Claim

In the Croydon Registrar's Court on August 17th Miss R. L. Virgin, Egerton Road, South Norwood, was sued by Buxton and Longley, Ltd., electrical contractors, of Thornton Heath, for £4 for fixing four lighting points in her house.

Miss Virgin's case was that the work was done quite satisfactorily, but Mr. Buxton, she alleged, told her that if the cable from the mains were laid under the garden path the Croydon Corporation Electricity Department, which did that part of the installation, would reinstate the path. She found afterwards, however, that the Corporation did not do that, and spent £1 on gravel for making the path good. She therefore tendered £3 to plaintiffs, in full payment, but it was refused. Miss Virgin maintained that Mr. Buxton should be made liable for the mistake made. Mr. Buxton, however, said that the Corporation men wanted to put the cable under the garden, but Miss Virgin "dictated" that it should go under the path. He denied having said that if the men spoilt the path they would make it good. Mr. Registrar Humfrey awarded plaintiffs the full amount claimed, and said that Mr. Buxton could not be legally bound by any advice or opinion given outside his contract, which was properly completed. Such opinion was no more binding than that of a next-door neighbour.

Netherlands East Indies Electrical Trade

In his report on economic conditions in the Netherlands East Indies for 1936-37, prepared for the Department of Overseas Trade, Mr. L. B. S. Larkins, British Commercial Agent at Batavia, states that the year under review saw a welcome change in the economic conditions after five years of acute depression. It marked the culmination of the policy of consolidation and retrenchment carried out during the crisis period; confidence was restored and a depleted exchequer materially replenished. While the import trade in raw, semi-finished and manufactured goods increased, there was a slight decline in United Kingdom imports, which is ascribed to the incidence of barter transactions on a big scale between the Netherlands East Indies and the United Kingdom's competitors, protection of Netherlands and local industries, the effect of international cartels, and, more recently, to the sharp rise in prices for United Kingdom products of the heavy industries. The prices of British turbines and electrical equipment were said to be too high and orders had been placed with a Swiss-Dutch combine for three 7,300-h.p. turbines for the new power station in Central Java and in Holland for generators, transformers, cables, &c. Tables at the end of the report show that the value of imports of wireless apparatus and parts was 1,116,037 guilders in 1936, as compared with 1,204,238 guilders in 1935, and of this total the United Kingdom's share was 61,734 and 40,935 guilders respectively, while Holland's share was 875,233 guilders in 1936 as compared with 939,850 guilders in 1935. The value of imports of radio valves increased from 583,359 guilders in 1935 to 640,409 guilders in 1936, those from the United Kingdom being valued at 5,743 and 9,588 guilders, and from Holland 521,832 and 596,995 guilders respectively. Imports of dynamos, electro-motors, transformers, &c., totalled 620,000 guilders in 1936 as compared with 462,000 guilders in 1935, the following figures showing the value of imports from the United Kingdom and chief competing countries during the past two years:—

	1935.	1936.
	(in 1,000 guilders)	
Holland	177	225
United Kingdom	17	11
Germany	153	205
Sweden	18	32
U.S.A.	60	57
Japan	3	—

Orders Recently Booked

The Trix Electrical Co., Ltd., has secured a contract for the supply of a complete amplifying system to be installed in the London Stock Exchange. The equipment includes multiple loudspeaker points throughout the building, with double-channel amplifier and radio and microphone inputs.

A Cinema Lighting Installation

The new Davenport Cinema, Stockport, has many interesting features, among which is the Holophane moulded contour lighting scheme. On entering the auditorium the eye is attracted to the bas-relief design of silvered flutings and rectangles which surround the proscenium arch and expand from the orchestra pit along the side walls to the ceiling near the edge of the circle. The lighting of the rectangular section, which has deep concave recesses, is accomplished by two rows of battens concealed in the orchestra pit. The lighting of the side wall flutings is by means of special Holophane fittings built into the front of the circle. There is a full-sized stage, which is equipped with Holophane draperies consisting of a pair of black velvet curtains, a pair of black appliqué screen curtains, a champagne silk festoon curtain with special track for contour designs, leg curtains and borders. The stage lighting equipment consists of two 4-colour battens and one float with new zone type reflectors, two vertical proscenium battens and two large-type wing flood trolley units. The control is by means of the Holophane auto-selective system from a 4-panel selector controller board, which can be operated from the stage or the operating box as required. The back of the hall over the gallery is lighted by a moulded contour design alcove in which the colours work in harmony with house lighting. Under the balcony the white lighting is by the new prismatic circular close ceiling fittings. A soft amber lighting effect comes from the two troughs which extend across the ceiling under the balcony. The café extends over the entrance, the lofty centre section being flanked by two lower ceiling sections on each side. The lighting is by a large four-light cluster fitting of "Ripple-Lite" units, while the lower ceiling height of sections at each side are equipped with the indirect lighting "Auralite" units. The entrance hall and foyer is also lighted by "Auralite" units with crescent brackets for the smaller wall bracket points. Bulkhead units are used

The auditorium of the Davenport Cinema, Stockport

for other positions. A colour lighted fountain in the recess between the stairs to the circle and balcony is an attractive feature. The Western Electric "Mirrophonic" sound system has been installed.

Social Events

Under ideal weather conditions races and various athletic events were staged at Carn Brea by the Cornwall Electric Power Co. on August 21st for its employés throughout the county. The gathering also had an opportunity of witnessing an exhibition of Cornish wrestling, a display being given by Mr. F. Hitchens, of Helston, and Mr. J. F. Penrose, of Carn

Brea. The prizes were presented to the successful competitors in the various events by Mrs. D. H. Kendon, wife of the manager.

The annual horticultural show and garden party of the Clesco Sports and Social Club (County of London Electric Supply Co. and its associated companies) is to be held at the Clesco sports ground, Raynes Park, to-morrow (Saturday).

A Questionnaire

We are asked by Wm. Sanders & Co. (Wednesbury), Ltd., to thank municipal engineers who have replied to their recent questionnaire. Later, when all replies have been received, they will be preparing an analysis of the views expressed.

B.S.I. Handbook

The British Standards Institution has issued its half-yearly handbook which includes the annual report for 1936-37 and indexed lists of British Standard Specifications to July, 1937, and those in course of preparation. A further section is devoted to an index of the methods of tests contained in the various British Standards. Copies of the new handbook (ref. CE. 4,300) are available from the British Standards Institution, Publications Department, 28, Victoria Street, London, S.W.1, price 1s. 4d., post free.

Belgian Electric Cooking Propaganda

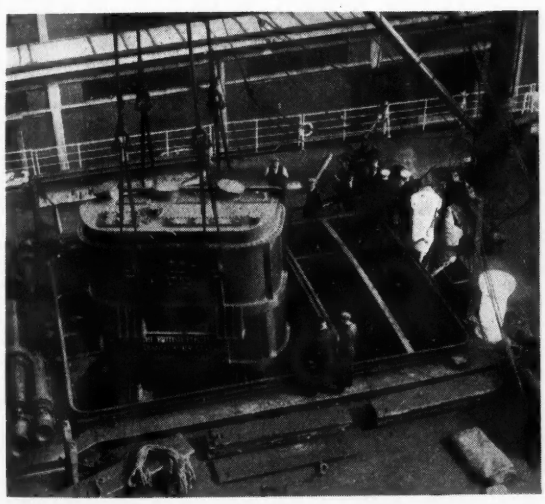
Our Belgium contemporary *Eclairage et Force Motrice* reports that the various electricity supply undertakings in the Antwerp district, in conjunction with the local electrical contractors' association, have opened a special establishment known as "L'Electrokeuken." The premises, which are open daily, contain a display of different kinds of electric cooking stoves and appliances, and on Monday and Thursday afternoons there are free cooking demonstrations.

New E.C.A. Members

At a recent meeting of the E.C.A. Council a number of applications for membership were considered, and the following contractors were admitted to full membership:—The Bradford Metal Case Co., Ltd., Bradford; F. Winsborough, Minehead; J. & T. Craig (Belfast), Ltd., Belfast; S. B. Wainwright & Co., Ltd., Manchester, 1; Burch & Vertue, Aldershot. Forrest & Webb, Handsworth, were admitted to associate membership.

Large Transformers for Australia

The British Electric Transformer Co., Ltd., has recently received a repeat order from the Victoria State Electricity Commission for an 80-ton transformer. The first order received by the company was for a 90-ton transformer, which



A B.E.T. transformer being loaded for shipment to Australia

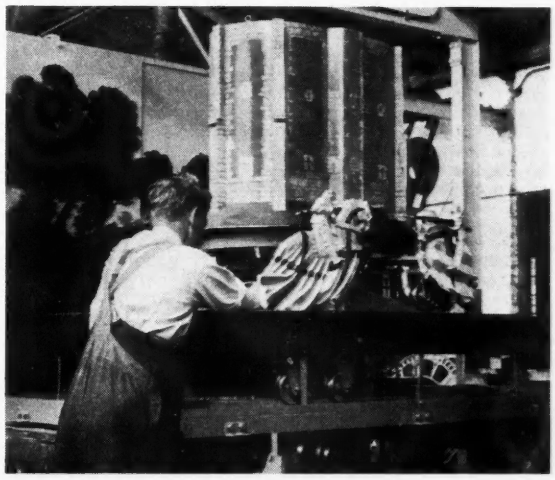
is claimed to be the largest ever shipped to Australia, while the most recent shipment was of three 24-ton transformers of the oil-immersed, naturally cooled, outdoor, core-type with an equivalent double-wound output of about 50,000 kVA.

New Showrooms at Redcar

The new electricity showrooms of the Redcar Corporation are to be formally inaugurated on Wednesday next.

Novel Electric Clocks for Perth, W.A.

Two unusual "Automata" electric clocks this week left the Turret Works of the Synchronome Co., Ltd., at Alperton, on their way to Perth, Western Australia, where they will be installed in two towers at London Court. In one case 2 ft. 9 in. figures of St. George and the Dragon will appear at oriel windows in the tower. At the first quarters of the hours St. George will strike at the Dragon with a sword and miss, but at the completed hours he will appear to cut off its head. Two pairs of knights jousting form the subject for the other clock. The first pair charge each other and miss, while one of the second pair has his lance knocked up. The figures revolve



Putting the finishing touches to one of the Synchronome Co.'s "Automata" electric clocks before despatch to London Court, Perth, Western Australia

on an oblong track and they are driven by a ¼-h.p. motor through oil-immersed reduction gears and spur gears. The mechanism is set in motion by mercury switches operated by a step-by-step impulse movement.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

CHEMICALS, ETC.	Price. August 25th.	Fortnight's Inc. or dec.
a Acid Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£36	—
a Ammonia, Muriate (large crystal)... ,,	£18 10s.	—
a Borax ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£22 10s.	—
a Potash, Chlorate ... ... per lb.	3¾d. to 4¼d.	—
a ,, Perchlorate ... ... ,,	6d.	—
a Shellac ... ... per cwt.	£4 18s.	—
a Sulphur, Commercial ... ... per ton	£11	—
a ,, Roll ... ... ,,	£11	—
a Soda, Chlorate ... ... per lb.	3¼d. to 3¾d.	—
a ,, Crystals ... ... per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks ... ... per lb.	4d. net.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£100 to £105	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil... ... ,,	1/3 to 2/9	—
p Babbitts Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£249	—
Grade II ... ... ,,	£172	—
Grade III... ... ... ,,	£91	—
c Brass (rolled metal 2" to 12" basis)... per lb.	9¾d.	¼d. dec.
c ,, Tubes (solid drawn) ... ... ,,	1/0¾ to 1/1	—
c ,, Wire, basis ... ... ,,	10d.	¼d. dec.
c Copper Tubes (solid drawn) ... ,,	1/2¼d.	—
g ,, Bars (best selected) .. per ton	£93	£4 dec.
g ,, Sheet... ... ... ,,		
g ,, Rod ... ... ,,		
d ,, (Electrolytic) Bars ... ... ,,	£67 10s.	—
d ,, ,, Wire Rods ... ,,	£72 10s.	—
d ,, ,, H.C. Wire ... per lb.	10 ⅛d.	—
f Ebonite Rod ½" dia. & up ... ... ,,	1/10 to 2/9	—
f ,, Sheet ⅛" thick & up ... ,,	1/7 to 1/10	—
n German Silver Wire, Nos. 1 to 12... ,,	2/5	—
h Gutta-percha, fine ... ... ,,	nom.	—
h India-rubber, Para-fine ... ... ,,	9¼d.	—
i Iron, Pig (Cleveland, No. 3) ... per ton	£4 5s.	—
i ,, Wire galv. No. 1, P.O. Qual.... ,,	£23	—
g Lead, English Pig ... ... ,,	£24 5s.	£1 5s. dec.
g Mercury ... ... per bot.	£13 12s.	2s. inc.
c Mica (in original cases) small ... per lb.	10d. to 2/–	—
e ,, ,, ,, medium ... ,,	6/– to 12/6	—
e ,, ,, ,, large ... ,,	13/– to 17/6 up	—
p Phosphor Bronze, plain castings ... ,,	1/3½	—
p ,, ,, drawn bars & rods ,,	1/4	—
p ,, ,, rolled strip & sheet ,,	1/2	—
p ,, ,, wire ... ... ,,	1/3½	¼d. dec.
o Platinum ... ... per oz.	£10 5s.	—
d Silicium Bronze Wire ... ... per lb.	11¼d.	—
g Spelter ... ... per ton	£24 5s.	£1 5s. dec.
r Steel, Magnet, in bars ... ... per lb.	7¾d.	—
g Tin, Block (English) ... ... per ton	£260 5s.	£7 15s. dec.
n ,, Wire, Nos. 1 to 16 ... ... per lb.	4/3	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g Henry Gardner & Co., Ltd.
h Edward Till & Co.
i Bolling & Lowe.
n P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.
r W. F. Dennis & Co.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead, rubber, tin and spelter, up to the time of going to press, are given in our "Business Notes" under the same heading.

Trade Announcements

John Moores & Co., wholesale electrical and wireless distributors, have removed to 31, Quay Street, Manchester, 3. The telephone number remains unchanged, but the telegraphic address is "Rolyata" Manchester.

Messrs. Buckley—a Manchester firm of engineers and gear-cutters established many years ago—have been registered as a limited company for reorganisation and expansion purposes. The business was founded by Mr. W. W. Buckley thirty-two years ago. A new factory is being erected at Elsinore Road, Old Trafford, and the reorganised company will specialise in the production of all types of machine-cut gears of sizes up to 54-in. Mr. Buckley continues in office in an advisory capacity.

The Eastnor Electric Co., Ltd., specialists in die casting in all metals, are also erecting a new factory in Elsinore Road, where modern gravity and pressure die casting machines are shortly to be put into service to produce at a rapid rate intricate die castings in all metals, including brass, copper and electron.

The telephone number of Tubelight Holders, Ltd., has been changed to Sloane 2808.

The head office of Jas. Kilpatrick & Son, Ltd., has been removed to Kelvin House, River Cart Walk, Paisley.

For Sale

Birmingham Electric Supply Department invites offers for the purchase of surplus lead.

Dover Corporation invites offers for the purchase of one 510-h.p. engine and one 1,250-kW turbine.

(See our classified advertisements.)

Leipzig Autumn Fair

The general samples and building sections of the Leipzig Autumn Fair are to open on Sunday next and will continue until Thursday, September 2nd. Further information concerning the exhibition can be obtained from the London office of the Fair, First Avenue House, 45, High Holborn, W.C.1.

New Catalogues and Lists

Westinghouse Brake & Signal Co., Ltd., 82, York Road, King's Cross, London, N.1.—Booklets describing metal rectifiers, their use and application; battery chargers for a.c. mains; and rectifiers for telecommunication.

Bratt, Colbran, Ltd., 10, Mortimer Street, London, W.1.—An art catalogue of electric fires, illustrated in colour.

C. V. Bolton, 49a, Leigh Road, Leigh.—Details of the "Humatagraph" recording hygrometer.

Novonotions, Ltd., 64, Victoria Street, London, S.W.1.—A leaflet dealing with the "Telelite" adjustable lamp.

Davidson & Co., Ltd., Sirocco Engineering Works, Belfast.—An illustrated leaflet appertaining to "Sirocco" fans.

Cambridge Instrument Co., Ltd., 45, Grosvenor Place, London, S.W.1.—A pamphlet on CO_2 apparatus for steam raisers.

Bankruptcy Proceedings

J. N. Waring, residing at 22, Grangecliffe Gardens, Sydenham, S.E.25, and lately carrying on business at 9, Sandland Street, Bedford Row, W.C.1, electrical engineer.—The first meeting of creditors was held on August 18th at Carey Street, W.C.2. The debtor did not attend and the Official Receiver, Mr. C. Bruce Park, said that he had not been able to obtain any information from the debtor, but according to various statements received from creditors the liabilities were in the neighbourhood of £1,887. The estate was left in the hands of the Official Receiver.

C. Street (Fylde Crystal Lamp Co.), electric lamp distributor, formerly trading at 55, Coronation Street, Blackpool, and now residing at 164, Preston Old Road, Blackpool.—Receiving order made August 11th on a creditor's petition. First meeting August 30th at 9, Fox Street, Preston. Public examination October 8th at the Court House, Blackpool.

S. Holmes, electrical and wireless engineer, formerly carrying on business at 41, High Street, South Normanton, and now residing at 37, Downing Street, South Normanton.—Receiving order made August 14th on debtor's own petition.

L. A. W. Steinmetz, electrical dealer, 56, Bromham Road, Bedford.—First meeting August 30th at 6, The Parade, Northampton. Public examination October 5th at the Shire Hall, Bedford.

B. Adams (Electrical Supply Stores), electrical dealer, lately carrying on business at 36-37, Merchant Street, Bristol.—Trustee, Mr. H. Wheeler, 26, Baldwin Street, Bristol, Official Receiver, released August 10th.

G. E. Grainger (Grainger & Co.), wireless engineer, 38, Market Street, Ashley-de-la-Zouch.—Last day for receiving proofs for dividend September 4th. Trustee, Mr. A. J. Rogers, 22, Regent Street, Park Row, Nottingham, Official Receiver.

V. F. Smith (R.W. Products), radio aerial manufacturer, 12, High Street, Old Woking, Surrey.—Receiving order made August 12th on a creditor's petition.

J. R. Brightwell, electrical contractor, 107, Queen's Road, W.2.—Discharge suspended for eighteen months until January 21st, 1939.

S. Perkins, wireless dealer, 1, Lodge Lane, Beeston, Leeds.—Application for discharge to be heard on October 1st at the County Court House, Leeds.

Company Liquidation

Sterilizair, Ltd.—Particulars of claims by September 29th to the liquidator, Mr. T. G. Weavers, 5, Budge Row, Queen Victoria Street, E.C.4.

Private Arrangement

J. & H. Russell, wireless dealers, 21, Coventry Street, Kidderminster.—At the meeting of the creditors the statement of affairs showed liabilities of £1,029, against assets of £451, leaving a deficiency of £578. It was decided to accept a composition of 10s. in the £.

Electricity Supply

Lighting, Domestic, Power

Aysgarth (Yorks).—RURAL SUPPLIES.—The Rural District Council is to supply electricity to Sedbusk, Appersett, Hardrow, Burterett, and Simonstone.

Barking.—BULK SUPPLY.—Austins (East Ham), Ltd., propose to cease generating electricity and to take the whole of their supply from the Corporation's existing high-voltage system.

Belgium.—ELECTRIC POWER SUPPLY PROGRESS.—So far this year there has been a noteworthy increase in the production of electric power in Belgium, official figures just issued showing a total of 2,730,669,159 kWh for the six months ended with June last as compared with 2,366,827,884 kWh in the corresponding half of 1936, representing an advance of over 15 per cent.

Bexhill.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains to the Grange Court estate at a cost of £545.

PUBLIC LIGHTING TARIFF.—The Electricity Committee proposes to reduce public lighting charges from 1.75d. to 1.25d. per kWh.

Cardiff.—PLANT EXTENSIONS.—Extensions to the plant at the power station, costing over £400,000, are under consideration by the Central Electricity Board. The extension scheme, prepared by the Corporation at the request of the Board, includes the installation of a 30,000-kW generating set and two large boilers. Last year fears were entertained that the power station would be closed for about three months annually, but assurance has been given that the station will continue to work on a two-shift basis.

Ceylon.—NEW HYDRO-ELECTRIC PROJECT.—Our Bombay correspondent reports that the first stage in the construction of the Aberdeen-Laxapana hydro-electric scheme, costing Rs.150 lakhs, has now been sanctioned by the Ceylon legislature. It entails the construction of a 345-ft. long dam, the top of which is to be 94 ft. above the original river bed and 2,844 ft. above sea level. The water impounded is to be conveyed through a tunnel 7,863 ft. long to a surge chamber on the hillside in the Laxapana valley, and from there it will be conducted through pipe lines to the power station on the banks of the Maskeliya Oya, 1,500 ft. below. The capacity of the pipe line will be sufficient for 15,000 kW of plant, and the power station will house three Pelton wheel-type water turbines direct coupled to 11,000-V three-phase alternators, having a total capacity of 25,000 kW. Adjoining the power station will be a transformer station where the supply will be stepped-up to 66,000 V and transmitted over a double-circuit main transmission line to Colombo and connected with the existing system.

Chesterfield.—BETTER LIGHTING.—The lighting of the new roads adjacent to the town hall is to be improved by the erection of sixteen concrete columns with lanterns at an estimated cost of £470.

Clitheroe.—DUNSOP BRIDGE SUPPLY.—The Electricity Commissioners have suggested that the Town Council might, when the opportunity arises, review the question of affording a supply of electricity to property in the vicinity of Dunsop Bridge.

Corby (Northants).—SUB-STATION.—The Kettering Urban District Council is to erect a sub-station on Cottingham Road Estate.

Darlington.—MAINS.—Distribution mains are to be laid by the Town Council in Abbey Road, off Carmel Road, Geneva Road West, off the Polam Hill Estate, The Mount, Neville Road, and from Priors Buildings to Chiltons Buildings.

Denbighshire.—PROPOSED CONFERENCE.—A resolution has been passed by the County Council in support of a conference of representatives of the six North Wales county councils and electricity undertakings for the purpose of giving consideration to the proposal of the North Wales Power Co. to apply for powers to take over the supply and distribution of electricity in the area of the North Wales counties.

Dover.—EXTENSION ORDER.—The Dover Electricity (Extension) Special Order has now been made by the Electricity Commissioners and approved by Parliament. It enables the Corporation to supply electricity within the part of the borough of Dover which was, prior to the Kent Review Order, 1934, contained within the parishes of Hougham Without and Poulton.

Easington.—OVERHEAD LINE.—The Rural District Council is to meet representatives of the North-Eastern Electric Supply Co., Ltd., to discuss the company's proposal to construct an overhead line at Murton.

Eastbourne.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains in Victoria Drive, at a cost of £390.

France.—STATE AID FOR SYSTEM INTERCONNECTION.—At the recent annual meeting of the Compagnie Lorraine d'Electricité it was stated that in order to bring about further interconnection between the electric power supply systems in north-eastern France the Government was contributing towards the cost of a new 150-kV transmission line between Arbouans and Ronchamp, and a 65-kV line between Vincey and Froncles.

Glasgow.—DEVELOPMENTS DURING THE YEAR.—Further details are now available concerning the progress made by the Electricity Department during the past year. The sum of £833,627 was expended on capital account, principally in connection with extensions at Dalmarnock power station and additions and extensions to mains and sub-station equipment. The Dalmarnock extensions include the installation of two turbo-alternator sets, each rated at 50,000 kW, the first of which will be in commission for the coming winter's load and the remaining set a year later. The extensions to the distribution system include the laying of 29 miles of high-voltage and 56 miles of low-voltage cables.

WIRING HOUSES.—Electric lighting is shortly to be installed, at a cost of £3,775, in 811 houses erected under the City improvement Acts.

NEW EQUIPMENT.—Sanction has been obtained to the borrowing of £77,966 by the Electricity Department for the provision of main transmission cables and ancillary protective cables, &c.

MAINS.—Distributing mains are to be laid at a cost of £34,741.

X-RAY APPARATUS.—Authorisation has been given to the medical officer of health to obtain electro-medical apparatus required at Lennox Castle Institution at a cost of £493.

BATTERY CHARGING.—The Cleansing Committee is to extend the battery charging plant at Govan garage at an estimated cost of £3,840.

Irish Free State.—HYDRO-ELECTRIC SCHEME.—Ministerial sanction has been given to the Dublin Corporation's proposal to raise a loan of £896,000 in connection with the hydro-electric scheme at Poulaphouca, County Wicklow. The scheme was first brought about by the growing demand for water in Dublin City, and advantage was taken of the increasing needs of the Electricity Supply Board for another source of power to supplement the Shannon Scheme and the Pigeon House power station, Dublin, to co-operate with the Board for a joint hydro-electric and water supply scheme at Poulaphouca. The Liffey Reservoir Act authorised the construction of a main reservoir at Poulaphouca by the Electricity Supply Board, and gave legal effect to an agreement between that body and the Corporation by which the latter will have the right to draw 20 million gallons of water per day from the new source of supply. It is anticipated that the scheme will be completed early in 1940. The main reservoir will consist of a dam across the Poulaphouca Gorge to maintain a height of 615ft. of water. Towards the construction of this reservoir and its maintenance the Dublin Corporation is to pay the sum of £126,000.

London.—LEWISHAM.—The Works Committee is to improve street lighting by the use of 125-W mercury vapour discharge lamps at a cost of £1,798.

Midgley (Halifax).—OVERHEAD LINES.—Consent has been given by the Council to the proposal of the Yorkshire Electric Power Co. to extend the overhead lines from Greave House Farm to Springfield Terrace.

Nelson.—RURAL SUPPLY INAUGURATED.—The supply of electricity by the Corporation to rural areas in the Pendle Valley was inaugurated on August 21st, the ceremony being performed at Barley Green by Alderman R. Winterbottom, chairman of the Electricity Committee. Mr. T. D. Martin, the borough electrical engineer and manager said that the total length of cable used, underground and overhead, was approximately 19½ miles and the area taken over by the Special Order was approximately ten sq. miles. In seven sq. miles of this area there was an average population of only 75 to the square mile. Estimated capital expenditure was approximately £3,500 and the revenue £307.

Northern Ireland.—ELECTRICAL PROGRESS.—Another year of progress in the development of the Northern Ireland electricity supply is recorded in the report of the Ministry of Commerce on its proceedings under the Electricity (Supply) Acts, 1882 to 1936. The sale of electricity by the undertakings working under statutory powers shows an increase from 142,428,666 kWh in 1935 to 169,490,369 kWh last year, an increase of 27,061,703 kWh, or 19 per cent, and since the establishment of the Electricity Supply Board five years ago consumption of electricity has increased by almost 125 per cent., the improvement being shared by all the undertakings. Substantial extensions have been made to the three main generating stations at Belfast, Londonderry and Larne. At Belfast a new 30,000-kW generator was brought into service at the Harbour power station, and sanction has been received to install another of similar capacity to meet the growing demand from the city area and the Electricity Supply Board. The Londonderry Corporation installed an additional 6,000-kW generator mainly to provide further supplies to the Electricity Board for distribution in the north-west area while the Larne Electric Light and Power Co. has also installed additional plant to meet the requirements of the Antrim Electricity Supply Co., which supplies the principal towns in Antrim and the southern portion of Londonderry. There have been considerable extensions in the main transmission and distribution lines. Belfast Corporation laid over forty-eight miles of underground cable, as well as twelve miles of overhead construction. The Board completed a main line from Omagh to Enniskillen with extensions to Irvinestown and Ballinamallard, and a number of other works were carried out to improve the operation of the system.

Plymouth.—MAINS.—Electricity Committee is to carry out mains extensions at a cost of £4,800.

Poland.—HYDRO-ELECTRIC WORKS.—The Minister of Communications is to undertake the construction of three hydro-electric works. The first on the river Dunayetz is to be rated at 10,000 kW; the second on the Sola at 20,000 kW; and the third on the San at 30,000 kW. The work will be completed next year.

Salford.—ELECTRIC CRANE.—An electrically operated floating crane has been installed at the docks. It can deal with general loads up to 125 tons in weight and lock gates up to 250 tons, and can also be used for salvage work, having a lifting capacity of 250 tons. It is 147 ft. long.

Stoke-on-Trent.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains at Bradwell Hall Farm Estate, Porthill, at a cost of £1,000.

NEW EQUIPMENT.—The transformer capacity at the works of the Metallic Tile Co. (Rowley Bros.), Ltd., Bradwell Wood, is to be increased at a cost of £300, and the pole transformers supplying the Chell Green area are to be replaced by equipment of larger capacity, at a cost of £450. The Electricity Committee has also obtained sanction to borrow £2,211 for additional equipment at three sub-stations.

Sunderland.—SUB-STATION.—The North-Eastern Electric Supply Co., Ltd., is to erect a sub-station on the Plains Farm Estate.

LOAN.—Sanction has been received by the Town Council to borrow £1,195 for the provision of a transformer and cables in connection with extensions to the Municipal Hospital.

Whitby.—SUPPLY TO GOATHLAND.—The North-Eastern Electric Supply Co., Ltd., estimates the cost of supplying electricity to Goathland by overhead lines at £5,000 and by underground cables at £7,000. The matter is being considered by the Rural District Council.

Traction

Austria.—ELECTRIFICATION.—A start has been made with the electrification of the principal main line of the Austrian Federal Railways, that between Vienna and Salzburg. At the moment only the Salzburg-Linz section is in hand, but it is proposed to convert the Salzburg-Attnang section by October, 1938, and the Attnang-Linz section by October, 1939. The estimated cost of electrifying the whole 196 miles from Vienna to Salzburg is 55 million schillings (£2,150,000 at the present rate), and the estimated annual energy consumption is 96,000,000 kWh.

Brazil.—FURTHER ELECTRIFICATION.—In addition to the Rio-Barra do Pirahy main line, the first suburban section of which out of Rio has just been opened to electric traction, the Central Railroad of Brazil is proposing to electrify on the same 3,000 V d.c. system, the line from Sabara to Santa Barbara, over which a heavy mineral traffic is anticipated.

Finland.—INDUSTRIAL ELECTRIC LINE.—It is reported that the Petsamo Nickel Co. is to build a 40-mile electric railway from the mines to the sea, and that this line will be fed with energy supplied from a new hydro-electric station.

Germany.—NEW EXPRESS TRAINS.—Several new semi-streamlined single-phase electric trains have been put into operation on the Bavarian section of the German State Railway. They have an increased capacity compared with the two-car sets introduced in 1935 and 1936, and have an hourly rating of 1,420 kW.

Glasgow.—REFUSE COLLECTION VEHICLES.—Already operating over sixty electric vehicles for refuse and dust-collecting purposes, the Cleansing Department has just put in service a number of Metropolitan-Vickers electric vehicles of a new type fitted with specially low-loading large-capacity closed bodies, rated at 3 tons. Tudor batteries are used, housed in a compartment behind the driver's cab.

ESTIMATES.—The manager of the Transport Department estimates capital expenditure for 1937-38 as follows: New turbo-generator for Pinkston power station, £110,000; Kinning Park sub-station, four rotary convertors, £20,000; and tramcars, £200,000.

Italy.—NEW ELECTRIC RAIL MOTOR COACHES.—Last year the Società Trazione Elettrica Lombarda (STEL) put into service six new electric rail motor coaches between Milan and suburban localities of that city. Particulars of these are given in the *Brown Boveri Review*. The bogies and electrical equipment were ordered from Tecnomasio Italiano Brown Boveri, Milan, while the coach bodies were built by the Officine della Società Ernesto Breda at Sesto S. Giovanni. During hours of peak traffic, they must run with one or two trailers and alone when traffic is light. Each motor coach is equipped with four driving motors of relatively high one-hour output rating; they are designed to carry heavy overloads and for automatic control, especially when starting, the driver being able to choose any one of six acceleration values. The length of coach body is 47½ ft. and the maximum width 7 ft. 8 in. The wheel base

of four-wheel bogies is 5 ft. 10 in. and the diameter of wheels 30 in. The one-hour rating of each 550/2 V 175 A motor is 56.5 h.p. at 1,130 r.p.m. The coaches weigh 22 metric tons and are designed to accommodate 41 sitting and 80 standing passengers, the maximum speed on the level being 37½ m.p.h. Built to run in both directions, the vehicles are symmetrically subdivided into a central and two end compartments with doors at the two ends. The electro-pneumatic door-closing gear is arranged so that the coaches can start only when all doors are closed. Eight 600-W heaters are built into each coach. Of the four driving motors, two are always connected in series; they are series-wound, having four main and four auxiliary poles, and their continuous rating is 42 h.p. During running, the motors can be overloaded up to double the one-hour rating output. The automatic apparatus consists of a combination switch lodged under the coaches and controlled by a servo-motor which works by compressed air electrically remote-operated by means of a control switch in the driver's cab.

Leeds.—SILENCING TRAMCARS.—Trams are once more running in the City Square after the introduction of a new gyratory system. The tram track has been moved away from the Queen's Hotel and made noiseless by the substitution of special foundations.

London.—TRAFFIC SIGNALS.—The traffic signal installation at Piccadilly is shortly to undergo tests. All the controlling mechanism has been completed ready for examination by the Ministry of Transport.

Russia.—MOSCOW TUBE PLANS.—Constructional estimates for extensions to the Moscow tube system, totalling 125 miles, have been obtained, and the building of 30 miles has been sanctioned for the years 1937-1940. The most important of the lines to be built during the next three years are the Sadovaia circle and a radial line connecting the present station at Sverdlovsk Place with the Stalin automobile factory *via* the Pavlezki main line station. This 4-mile line will cross the Moscow river twice in deep level tunnels.

Sweden.—ELECTRIFICATION OF SMALL RAILWAYS.—Returns recently published show that in addition to the 2,000 miles of electrified lines owned by the Swedish State Railways there are nearly a dozen small private railways having electrified lines, totalling in all about 220 miles.

Communications

Ceylon.—BROADCASTING.—Broadcasting is becoming increasingly popular in Ceylon, the number of licences issued having increased to 3,756 in 1936 from 2,983 in the previous year. Eight hours a day is the average length of the programme at present. In view of the treacherous nature of the east coast of Ceylon, proposals made for the construction of automatic wireless beacons and direction finding stations at Galle and Arugam Bay are receiving favourable consideration.

India.—RADIO RESEARCH.—Several members of the Congress Party in the Assembly have tabled a resolution for next session with a view to encouraging and co-ordinating radio research and providing facilities for the consideration of scientific problems relating to broadcasting in India. The resolution recommends the establishment of a Radio Research Board on the lines of the corresponding body in Great Britain and the provision of the necessary funds for its operation out of the money set apart for broadcasting.

Jugoslavia.—TELEPHONIC COMMUNICATION.—The Jugoslavian Post and Telephone authorities have placed contracts in Germany for the necessary equipment for the extension of the telephonic facilities in the towns of Beograd, Zagreb and Ljubljana.

Newcastle-on-Tyne.—TELEPHONE CABLE.—A new underground telephone cable costing £76,000 was inaugurated between Newcastle-on-Tyne and Berwick on August 17th by Sir A. M. Sutherland (Newcastle) and Councillor J. A. Herricott (Berwick). Over 80 miles of duct and cable have been laid, and the overhead lines, including over 400 poles, have been removed. The new cable will prevent many rural exchanges, including Alnmouth, Alnwick, Amble, Ashington, Bamburgh, Beal, Berwick, Blyth, Charlton Mires, Lynemouth, Morpeth and Red Row, being isolated in winter owing to weather conditions.

Electrifying a French Suburban Railway

ELECTRIFICATION of the railway between the Luxemburg station in Paris and the Sceaux Robinson and Massy Palaiseau stations in the suburbs is now nearing completion. This conversion is intended to permit the line to be operated by the Paris Metropolitan Railways instead of, as formerly, by the Paris Orleans Co.

The line is about twelve miles long; it may, however, be extended later as far as St. Remy les Chevreuse. The electrification of the line as far as Massy has been accompanied by the reconstruction of certain sections to render its electrical operation easier and safer. Electricity is supplied through two sub-stations, each being fed at 10,500 V, three-phase by underground cables. At one there are four groups of two 750-V, 2,000-kW rotary convertors, each group being connected in series to provide 1,500 V, d.c. The other sub-station will be provided with three similar groups of convertors.

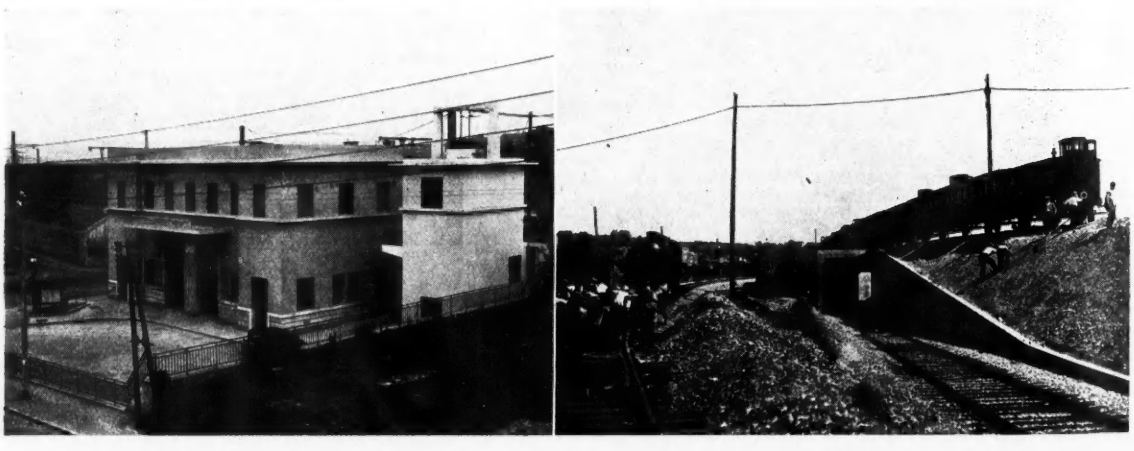
The trolley system consists of a main carrier cable from which an auxiliary carrier and a grooved copper trolley wire are suspended. The section of these various cables is calculated to give a cross section area equivalent to 400 sq. mm. of electrolytic copper.

There is a series of local transforming stations for the signals and station lighting. The signalling system, with quadruple indication, allows trains to be run at intervals of 2½ min. at speeds up to 50 m.p.h. All the signal lights are of the semi-automatic type, being connected to the track points, the movement of which automatically operates the corresponding signals.

By means of a system of magnets the signals are repeated on a board in the driver's cab and at the same time the position of each signal is marked on a paper band. The driver, on passing a signal, must indicate by pressure of a special button that he has seen it.

The rolling stock consists of electric motor coaches for the passenger service, and tractors for the goods trains. The motor coaches are provided with two 250-h.p. motors each, which are both connected to the shafts of one of the two bogies. The control of the motors is by a series of contactors operated by a camshaft which in its turn is actuated by a servo motor connected to a 48-V battery. The coaches are designed for a maximum speed of about 50 m.p.h., and are provided with Willison Robinson automatic coupling with the electrical connections made and opened manually. For ordinary operating conditions two motor coaches are to be coupled together, but it is possible to couple two or three motor coaches with from two to six passenger carriages for service during rush hours.

The goods trains, intended to be operated during the slack hours only, are drawn by tractors provided with four 250-h.p. motors with a control system similar to that of the motor coaches. These will be used to draw goods trains from the junction with the Paris Orleans line at Massy Palaiseau to the Denfert Rochereau station in Paris.



The Laplace station and (right) track cross-over at Bourg la Reine

Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Aldershot.—August 31st. Borough Council. Transformers and one transforming kiosk with switchgear. (August 13th.)

Australia.—MELBOURNE.—September 6th. City Council. Electrically driven centrifugal pump and spares. (T.Y. 25943/37.)*
MILDURA (VICTORIA).—September 15th. Electricity Supply Department. Switchgear. (T.Y. 25942/37.)*

Birmingham.—September 10th. Electric Supply Department. Domestic electrical apparatus for one year. (August 13th.)
September 15th. All-insulated switch-fuses for one year. (August 20th.)

Birtley.—Parish Council. Public lighting and overhead lines. (See this issue.)

Blackpool.—September 21st. Borough Council. Two sets of three oil-immersed, single-phase reactors. (August 20th.)
September 9th. Transformers, switchgear and switchboard. (See this issue.)

Cardiff.—September 13th. R.D.C. Electricity Department. Four 25-kVA and six 10-kVA transformers, and construction of e.h.v. and l.v. overhead lines. (August 13th.) Lamps. (See this issue.)

Cheddleton.—September 6th. Mental Hospital Committee. Six months' supply of electric lamps. G. Lawton, clerk, Cheddleton Mental Hospital, near Leek, Staffs.

Cleethorpes.—September 11th. Borough Council. H.v. switchgear. (August 13th.)

Dewsbury.—September 6th. Borough Council. Electrical stores. (See this issue.)

Edinburgh.—September 6th. Corporation. Electrical, heating and ventilating works at the Public Library, Dundee Street. City architect.
September 4th. Corporation. Six electric hydro-extractors at Simon Square washhouse and renewal of steam calorifier at Lochrin washhouse. City architect.
September 8th. Commissioners of H.M. Works. Electric lighting at the Criminal Lunatic Asylum, Carstairs. Engineer, H.M. Office of Works, 122, George Street (deposit £1 1s.).

Essex.—September 6th. County Council Education Committee. Electrical installation at the South West Essex Technical College, Walthamstow. (August 13th.)
September 30th. Equipment for the South-West Essex Technical College, Walthamstow. (See this issue.)

Farnworth.—September 10th. U.D.C. Electricity Department. L.v. paper cables. (See this issue.)

Finchley. — September 27th. Borough Council. Twelve months' supply of immersion heaters and circulators and aluminium utensils for use on electric cookers. (See this issue.)

Gloucester.—Electricity Committee. Twelve months' supply of electric cookers and water heaters. (See this issue.)

Heston and Isleworth.—September 7th. Borough Council. Fire protection equipment at the Electricity Works, Bridge Road, Hounslow. (August 13th.)

India.—September 8th. Bombay, Baroda and Central India Railway Co. 350 b.h.p. vertical four-cycle heavy oil engine. (August 20th.)
NEW DELHI.—January 11th. Stores Department. Electric table fans with flexible cords. (T. 18441/37.)*
December 7th. A.c. ceiling fans and regulators. (T.Y. 18439/37.)*
December 14th. D.c. ceiling fans and regulators. (T.Y. 18440/37.)*
MADRAS.—September 20th. Electricity Department. Distribution mains, sub-stations and street lighting equipment. (T. 18708/37.)*

Iran.—Ministry of Posts, Telegraphs and Telephones. Telegraph posts and wiring material. (August 20th.)

Lancaster.—August 30th. Town Council. Installation of electricity in houses on the Scotforth estate and completion of partly wired houses on the Halton Road estate. F. Hill, city surveyor, Town Hall (deposit £1 1s.).

Littleborough.—September 13th. U.D.C. E.h.v. feeder cables. (See this issue.)

London.—ISLINGTON.—September 14th. Borough Council. Street lamp columns and lanterns. (August 13th.)
KENSINGTON.—September 13th. Borough Council. Vehicle-actuated automatic traffic control signals at several road junctions. Borough surveyor, Town Hall, W.8.

Manchester.—September 13th. Markets Committee. Automatic electric passenger and goods lift. City architect, Town Hall (deposit £1 1s.).

Oldham.—September 6th. Borough Council. Lighting installation at forty-two bungalows. J. Ashurst, borough engineer, Municipal Buildings, 75, Union Street (deposit £1 1s.).

Perth and Kinross.—County Council. Electric lighting, bells and heating at Police Buildings, Dunblane. Smart, Stewart and Mitchell, architects, 40, Tay Street, Perth.

Plymouth.—September 8th. Corporation. Distribution boards and underground network disconnecting boxes. (August 20th.)

St. Helens.—September 4th. Corporation. Twelve double-deck top-covered four-wheel type trolley-buses complete. A. A. Jackson, general manager and engineer, Transport Offices, Hall Street.

Sheffield.—September 10th. Electricity Committee. Two 3-phase banks of 33,000-V oil-immersed reactors. (August 20th.)

Skelton and Brotton.—September 14th. U.D.C. Electricity Department. Transformers. (See this issue.)

South Africa.—JOHANNESBURG.—September 11th. City Council. Electricity meters. (T. 18080/37.)*
September 18th. Welding plant. (T. 18766/37.)*
October 7th. Union Tender and Supplies Board. Motor generator set. (T.Y. 18770/37.)*
CAPE TOWN.—September 1st. Electricity Supply Commission. Cables. (T.Y. 18252.)*
September 8th. Two 10-kVA. three 5-kVA and three 3-kVA transformers, with fittings. (T.Y. 18471/37.)*
PRETORIA.—September 10th. Union Tender and Supplies Board. Telephone switches. (T. 18085/37.)*
September 17th. Public Works Department. Two 250-kVA transformers, cable and four l.v. switches. (T.Y. 18455/37.)* Switchboard wire. (T. 18242/37.)* Tubular electric heaters and thermostats. (T.Y. 18456/37.)*
PORT ELIZABETH.—September 9th. Municipality. Transformer. (T.Y. 18438/37.)*

Stockport.—September 23rd. Corporation. Three 150,000 lb. per hr. boilers with coal bunkers and ash sluicing plant, and one 30,000-kW turbo-alternator with condenser and auxiliary plant. (August 20th.)

Stoke-on-Trent.—September 8th. Electrical Engineer's Department. Electric cookers, wash-boilers, kettles and storage water-heaters and circulators. (See this issue.)

Sunderland.—September 2nd. Corporation. Electrical installation at extension to the Municipal Hospital, Hylton Road. (See this issue.)

Swansea.—August 30th. Education Committee. Electric lighting, heating and power installations at the new junior school (block No. 2), Gors Road, Cockett. Borough architect, The Guildhall (deposit £2).

West Ham.—September 6th. Borough Council. Transformers, wires and cables and meters for twelve months. (August 13th.)

West Riding.—August 30th. County Council. Electric lighting and l.p. hot-water apparatus at Thorne Moorends new infants' school and at Selby High School. Education Officer, County Hall, Wakefield.
August 28th. Public Health and Housing Committee. Various works, including electrical, at the Harrogate and District General Hospital. West Riding architect, County Hall, Wakefield.
September 1st. Various works, including electrical, at the Child Welfare Clinic to be erected at Rawmarsh, near Rotherham. West Riding architect.

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* Further particulars from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Contracts Closed

Barking.—Electricity Committee. Accepted. Switchboard (£693).—Crompton Parkinson. Switchgear modifications at sub-stations: Axe Street, Gale Street, Harrold Road and Park Modern (£1,009).—A. Reyrolle & Co. Upner and Scoffin and Willmott (£525).—New Switchgear Construction Co. Woodbridge Road and Porters Lodge (£832).—Switchgear & Cowans.

Birkenhead.—Health Committee. Accepted. Electric cardiograph outfit for hospital (£200).—Victor X-ray Corporation.
Markets Committee. Accepted. Repairs to electrical installation at abattoir (£185).—L. W. Bryan.

Blackpool.—Highways Committee. Accepted. Electrical installation for lighting, heating and power at Anchorsholme pumping station.—G. D. Lax.
Electricity Committee. Accepted. Transformers.—Lindley Thompson Transformer & Service Co.
Parks Committee. Accepted. Additional lift at North Shore.—W. Wadsworth & Sons.
Education Committee. Accepted. Overhauling electrical installation at Grammar school.—J. W. Fielding & Co.

Clitheroe.—Electrical Engineer's Committee. Accepted. 3,000-kVA regulating transformer at King Lane sub-station.—English Electric Co.
Lighting Committee. Accepted. Lamps and standards for Primrose Bridge and Moor Lane.—G.E.C.

Darlington.—Town Council. Accepted. Coal-handling plant for the boiler house at the electricity works (£4,720).—R. Dempster and Son.
Accepted. Electric travelling crane in connection with the extensions to the electricity undertaking (£4,000).—Sir W. Arrol & Co.

Glasgow.—Health Committee. Accepted. Battery set for the operating theatres at Stobhill Hospital (£232).—Alton Battery Co.
Housing Committee. Accepted. Electric passenger lift (£807).—Etchells, Congdon & Muir.

Ilford.—General Purposes Committee. Accepted. Fire alarm instruments (£201).—Walters Electrical Manufacturing Co.

London.—L.C.C.—Wiring and fittings for the installation of electric lighting, power, domestic bells and patients' signalling systems at St. Andrew's Hospital, Bow:

	£		£
Read and Partners. Accepted ...	**2,022**	Jacob, White and Co.	2,149
Pinching and Walton	2,053	Archibald Meckhonik	2,157
W. J. Furse and Co. (London) ...	2,057	Arthur Cozens	2,352
White and Mantle	2,119	Blackburn Starling and Co. ...	2,399
City Electrical Co.	2,132	Alexander Hawkins and Sons ...	2,499

Alterations and additions to electric lighting, power, telephone and fire alarm services at Mile End Hospital:

	£		£
Pinching and Walton. Accepted	**568**	Francis Polden and Co.	632
Read and Partners	599	G. E. Taylor and Co.	636
Alexander Hawkins and Sons ...	608	B. French	638
Archibald Meckhonik	609	Holliday and Son (Electrical) ...	639
Buchanan and Curwen	613	H. J. Cash and Co.	651
W. J. Furse and Co. (London) ...	623		

Wiring and fittings at the Avery Hill Training College:

	£		£
Jones and Jennings. Accepted ...	**1,040**	Atozed (Kingston)	2,239
Archibald Meckhonik	1,208	Freeman Electrical Co.	2,250
Barlow Bros. and Co.	1,215	T. Clarke and Co.	2,322
E. and C. Champion	1,220	E. W. Merredew	2,337
F. R. Short	*1,336	Bower Engineering Works ...	2,346
Buchanan and Curwen	1,485		
Caine Pernot	1,733		

* After arithmetical correction.

Manchester.—Health Committee. Accepted. Installation of broadcast call system at Crumpsall Hospital.—G.E.C.

Electricity Committee. Accepted. 6,600-V switchgear for the High Street sub-station.—B.T.H.

Education Committee. Accepted. Alterations to the electrical installation at Mansfield Street school.—A. Loudon. Alterations to the electrical installation at the Northenden Clinic and electrical installation at open air school.—R. Seddon & Sons. Re-wiring at Styall cottage homes.—Broughton & Irlam Electrical Engg. Co.

Northern Ireland.—BELFAST.—Tramways Committee. Accepted. Overhead equipment for the experimental trolley-bus service on the Falls Road route (£12,313).—Clough, Smith & Co.

Stanhope.—Parish Council. Accepted. Extension of the overhead electrical network to Ireshopeburn.—F. Reid, Ferens and Co.

Walton and Weybridge.—U.D.C. Accepted. Twelve months' supply of electric wash boilers.—Siemens Electric Lamps and Supplies.

Whitley Bay and Monkseaton.—U.D.C. Accepted. Internal telephones in the Council Offices.—Telephone Rentals (Northern), Ltd.

Flameproof Mining and Industrial Gear

THE quarterly list of electrical apparatus for which certificates of flameproof enclosure have been issued during the three months ended June 30th is obtainable (price 1s. 3½d. each, post free) from the Mines Department, Dean Stanley St., London, S.W.1. Certification is in respect of (1) methane (firedamp), (2) petroleum and acetone vapours, and (3) coke oven and town's (coal) gases as follows:

Anderson, Boyes & Co., Ltd.—(1) Small three-phase motor and switch.

Automatic Telephone & Electric Co., Ltd.—(1) Mine haulage indicator with lamps.

British Jeffrey-Diamond, Ltd.—(1) D.c. conveyor motor.

British Thomson-Houston Co., Ltd.—(1) Push-pull cam master controller, remote control gate-end box, three-phase conveyor motor; (1 and 2) rotor cam controller, medium slip ring unit, motor; (1, 2 and 3) oil circuit breakers.

Charles Crofton & Co. (Engineers), Ltd.—(2) "Victor" fitting for 40-60 W lamps.

Crompton Parkinson, Ltd.—(2) Small d.c., single- and three-phase motors.

Electric Construction Co., Ltd.—(1 and 2) Slip-ring motors.

General Electric Co., Ltd.—(1) Motors; (2) battery signal bells, signalling transformer, three-phase motor; (1 and 2) remote control cabinet with relay and lamps for endless rope haulage, double-pole switch and fuse boxes.

Heyes & Co., Ltd.—(2) Double pole switch and condenser boxes, signal bells; (1 and 2) start-inch-stop push button switches for remote control.

Klaxon, Ltd.—(2) Small d.c. geared motor units.

Lancashire Dynamo & Crypto, Ltd.—(1 and 2) D.c. motors.

Laurence, Scott & Electromotors, Ltd.—(1 and 2) Small and medium d.c. generators and motors, slip-ring unit.

M. & C. Switchgear, Ltd.—(1) D.c. draw-out oil circuit-breaker.

Metropolitan-Vickers Electrical Co., Ltd.—(1) Slip-ring unit, remote control gate-end box; (1 and 2) medium slip-ring unit, motor, draw-out pillar type switchgear.

Mining Engineering Co., Ltd.—(1) Squirrel-cage motors, fan motor, remote control reversing starters, plug and socket connector, d.c. conveyor motors; (1 and 2) brake solenoid, d.c. motor.

Nalder Bros. & Thompson, Ltd.—(2) Moving iron indicating ammeter.

Parmiter, Hope & Sudgen, Ltd.—(1 and 2) Double-pole switch and fuse.

Switchgear & Cowans, Ltd.—(1) Oil circuit-breakers.

Veritys, Ltd.—(1) Well-glass fitting for 150 W lamps.

Allen West & Co., Ltd.—(1 and 2) Direct switching starter.

Witton-Kramer Electric Tool & Hoist Works.—(1) Three-phase solenoid with terminal box and fuses.

Wright Electric Motors (Halifax), Ltd.—(1) Conveyor motor and switch.

Notes

Switchgear Failure at Atherton

An interruption in the supply of electricity to the area served by the Lancashire United Transport and Power Co. occurred at 4 p.m. on Tuesday and, according to northern daily papers, lasted for nearly two hours. It is stated that the cause was a fire on the switchboard at Atherton generating station followed by an explosion which damaged the windows and roof. No one was injured.

Institute of Marine Engineers

An examination for admission to associate membership of the Institute of Marine Engineers is to be held from May 16th to 19th, 1938. The annual examination for admission of probationer students and students will be held from May 23rd to 31st, 1938, both in London and other centres. Full particulars of the syllabus and exemptions allowable may be obtained on application to the secretary, the Institute of Marine Engineers, The Minories, London, E.C.3.

Fatality

The death of a workman, James Hunter McLay, employed at the Tummel Bridge power station, Perthshire, was inquired into by the Sheriff and a jury at Perth on July 29th. A doctor said death was due to electric shock. There were marks on McLay's arm showing traces of burning. The control engineer at the power station, Alex. Sutherland, said deceased was engaged at one of a number of cubicles housing switchgear on the control gallery. A theory was that deceased, who had completed his job in the cubicle, had become faint and had fallen forward on to terminals. Another suggestion was that he had tripped at the door of the cabinet. The jury returned a formal verdict.

Institute of Transport Examinations

The Institute of Transport announces that the next examinations for graduateship and associate membership will be held on April 28th, 29th and 30th, 1938, in London and at a number of provincial and overseas centres. Full particulars may be obtained on application to the secretary, Institute of Transport, 15, Savoy Street, W.C.2. The closing date for applications is March 1st, 1938.

The A.S.E.E. Programme

The 1937-38 session of the Association of Supervising Electrical Engineers commences on October 19th, when Mr. J. R. Beard will deliver his presidential address. The programme for the remainder of the session is as follows:—October 23rd: Dinner and dance at the Hotel Russell, W.C.1. November 16th: "Lighting for Special Industrial Processes," by Messrs. F. Anderson and W. R. Stevens. November 24th: "Cold Cathode Tube Developments," by Mr. T. L. Collins. December 21st: "Electricity Regulations in Relation to Factory Electrical Equipment," by Mr. H. W. Swann. January 18th: "The Equipment of Large High Voltage Transforming Stations," by Mr. J. R. Kennedy. February 15th: "For and Against Compulsory Wiring Regulations and Registration." February 26th: Annual dinner and reunion at the Trocadero Restaurant, W.1. March 15th: "Electricity Distribution in Large Buildings," by Mr. J. Stinton Jones. April 12th: "Electric Water Heating," by Mr. P. Honey. With the exception of the lecture on November 24th, which will be held at Magnet House, Kingsway, W.C.2, all the lecture meetings will be held at the E.L.M.A. Lighting Service Bureau, 2, Savoy Hill, W.C.2.

Educational

The Day Department of the Polytechnic, Regent Street, W, reopens on September 21st and the Evening Departments on September 20th; enrolment from September 13th.

(See our classified advertisements.)

Appointments Vacant

Senior lady demonstrator and sales assistant for Sunderland Electricity Department.

Mechanical and electrical engineering assistants in the drawing office of the Air Ministry and at aerodromes.

Electrical draughtsman for Sheffield Electricity Department.

Commercial assistant in the Consumers' Department, West Gloucestershire Power Co., Ltd.

Shift charge engineer (sub-station charge engineer) for Weymouth and Melcombe Regis Electricity Department.

Assistant lecturer and a demonstrator in the Electrical Engineering Department, Imperial College of Science and Technology.

Outside sales assistant for Luton Electricity Department.

Testroom assistant for Battersea Electricity Department.

(See our classified advertisements.)

Our Service Department

EVERY day inquiries of all kinds are received by the Editors, the bulk of them relating to the producers of specified classes of electrical goods. We are able to reply to most of these with the aid of our extensive records, but in a few cases we have to seek the assistance of our readers. This week we have been asked for the names and addresses of manufacturers of the following:—

KUBEX cooker spares.
BETT'S electric fires.

Readers should enclose stamped addressed envelopes when making their inquiries.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Mr. J. C. Lane, city electrical engineer of Melbourne, is retiring from the service of the City Council in February next year on reaching the age limit. Mr. Lane, who succeeded the late Mr. W. H. Alabaster as city electrical engineer in 1934, has been in the service of the Melbourne City Council for twenty-nine years. The *Industrial Australian* reports that **Mr. B. Woodfull,** mains superintendent of the Electricity Department, is recommended as successor to Mr. Lane, at a salary of £1,500 per annum.

Lieut.-Col. W. E. Dennis, Continental operating manager for Electrical Research Products, Inc., London, for the past eight years, who has been appointed manager of the India branch of the Western Electric Co., Ltd., was the guest of his London colleagues at a farewell dinner at the Savoy Tavern on August 13th, Mr. T. M. Houston presiding. Following a speech by Mr. D. Price-Jones (Western Electric), Lieut.-Col. Dennis was presented with an engraved silver cigarette case from his London associates. On behalf of the Continental distributors, Mr. Houston presented him with a fitted pigskin dressing-case. Lieut.-Col. Dennis is sailing from Marseilles for Bombay on the *Viceroy of India*.

Mr. W. **Penman,** of Lancaster, has been recommended for the appointment of transport manager to the Darlington Corporation, a newly created post carrying a salary commencing at £700 and rising to £750 per annum. The appointment is subject to the confirmation of the Council at the end of this month. Hitherto, the trolley-bus services at Darlington have been looked after by Mr. J. R. P. Lunn, borough electrical engineer.

Mr. H. **Bentley MacKenzie** arrived in Buenos Aires on July 22nd to assume the duties of manager of the Western Electric Co., of Argentine. He succeeds **Mr. U. B. Ross,** who will resume the active management of the distributing houses in Chile and Peru, with headquarters at Lima.

Mr. H. M. W. Royce has resigned his position with W. H. Smith & Co. (Electrical Engineers), Ltd., Manchester, on his appointment as northern area manager for F. H. Wheeler & Co., Ltd., electrical contractors, of London. He has taken offices at Century Buildings, St. Peter's Square, Manchester.

Mr. W. T. Rushton, of Nathan & Allen, has joined Bratt Colbran, Ltd., as electrical sales engineer in London.

Mr. A. B. Wakefield, general sales manager of Coldair, Ltd., will, in consequence of domestic sales being transferred to the General Electric Co., Ltd., be relinquishing his position shortly. In 1933 Mr. Wakefield returned to England from Canada, where he was general sales manager for the Consolidated Industries, Ltd. His present address is, "The Gables," 71, Harrowdene Road, Wembley, Middlesex.

Mr. J. McCombe, Ph.D., has been appointed to the engineering staff of the Yorkshire Electric Power Co. He is at present transmission engineer with the Electricity Board for Northern Ireland, and will take up his new appointment in Leeds at the beginning of September.

Mr. J. R. Beard, M.Sc., M.I.E.E., has accepted the invitation of the Executive Council of the Association of Supervising Electrical Engineers to be the president of the Association, and he will be installed by the retiring president, Mr. H. Hobson, B.Sc., M.Inst.C.E., M.I.E.E., at the Association's meeting in London on October 19th, when Mr. Beard will deliver his presidential address. Born in Manchester in 1885, he was educated at the Manchester Grammar School and the Victoria University of Manchester. After some years with the Newcastle-on-Tyne Electric Supply Co. and the Cleveland and Durham Electric Power Co., he joined Merz & McLellan, London, and since 1930 has been a partner in that firm. He has been closely associated with the design and construction of the grid system, and with numerous power supply and traction schemes in England and abroad. He is the author of various papers on electrical transmission and distribution to the Institution of Electrical Engineers (Institution Premium), the Paris E.H.T. Conference, &c. Mr. Beard has been a member of the Council of the I.E.E. from 1927 to 1930 and from 1934 to the present time, and was chairman of the North-Eastern Centre of the I.E.E. in 1920. He was elected a vice-president of the I.E.E. in the recent ballot. Among other activities, he is a member of various committees of the B.S.I., B.E.I.R.A., and chairman of Section F (Conductors).

[Elliott & Fry.
Mr. J. R. Beard

Baron H. von Zeppelin has been appointed manager of the Western Electric recording activities in Japan, and sails for that country from America this week.

Obituary

Mr. H. R. Roose.—We regret to record the death of Mr. H. R. Roose, who was Government contracts manager to the Kniveton Cable Works, Ltd., of Queensway, Enfield.

New Books

Television Up to Date. By R. W. HUTCHINSON. (Second edition.) Pp. 211; figs. 142. London: University Tutorial Press, Ltd. Price 2s. 6d.

The Television Exhibition now open to the public at the Science Museum, South Kensington, includes demonstrations which astonish most visitors who view television reproduction for the first time. They appear to have regarded as incredible the possibility of seeing fairly clear reproductions on a small screen of events taking place simultaneously in some distant studio. The publication of the second edition of this little book at such a time is most opportune.

The first edition was reviewed in these columns in our issue of January 17th, 1936, and, good as that first edition was, the second edition far excels it. The scope of the book is widened and extended to cover much of the marked progress and developments attained to date, while the descriptions remain lucid, concise and deeply interesting throughout. The diagrams also merit high praise. The intricate subject of electron cameras is boldly treated and well, but the lay reader would probably find the explanations as to their mode of functioning easier to follow if that of the "Emitron" camera preceded instead of followed that of the image-dissector type.

All interested in the technical advances in television during recent years should make a point of seeing for themselves the accomplished fact by viewing the many models by different makers now working daily at the Science Museum, but, whether able to go or not, they should peruse this book at leisure.

Electric Trains. (Two Volumes.) By W. A. AGNEW. Pp. 220 and 506; figs. London: Virtue & Co. Price 45s.

This book is primarily intended for the information and use of the staff operating and maintaining electrified railways and its aim is to give information of practical value to these people; in other words, the book stresses the "how and what to do" rather than the "reason why." The subject matter comprises multiple-unit motor coach trains and electric locomotives at home and in various parts of the Empire, but does not include either Continental or American practice.

The book explains clearly and in detail the work entailed in operating and maintaining electrified railways, and the text is backed up by excellent diagrams, photographs and illustrations. It is the work of an expert and is written in a style which shows that care and thought have been bestowed on it. It can be confidently recommended to those to whom it is addressed especially; it will amply repay time spent on it by university and college students and should prove very acceptable to that section of the general public whose daily work is connected with the railways.

A short but interesting account of the early history of electric traction is included and also some theoretical first principles: in connection with the latter, the statement that "this property of retaining magnetism is called hysteresis" may not be acceptable to a purist. A noticeable omission from the book is a chapter devoted to modern chassis construction and springing, motor suspensions, gear and rod drives and brake rigging. The author may have decided that the space available did not warrant a description of these features, but their inclusion would have rendered the book complete.

That the book is up to date is shown by the fact that a chapter is devoted to the Metropolitan-Vickers "Metadyne" method of control, a promising system which, by keeping the starting current constant, enables a maximum starting tractive effort to be obtained from a minimum adhesive weight, which is an invaluable feature in short-distance rapid transport working.

Gases and Metals. An Introduction to the Study of Gas-Metal Equilibria. By COLIN J. SMITHELLS, M.C., D.Sc. Pp. 218; figs. 145. London: Chapman & Hall, Ltd. Price 18s.

The adsorption, diffusion and solubility of gases when in contact with metallic surfaces are treated in the three main sections of this work. Gas-metal equilibria are of considerable

importance in many industrial and manufacturing operations, such as in catalytic reactions, vacuum technique and metallurgical work. Adsorption on metallic surfaces is also of practical significance in connection with atmospheric corrosion, since it must precede chemical action. The fundamental principles involved are now well established, and the author has admirably summarised the researches and the available data, no attempt being made to deal with the practical applications.

The theories of adsorption are discussed in a logical manner, consideration being given to the experimental evidence and the question of how nearly the Langmuir concept gives a true picture of the process. The application of thermionics has thrown some light on several phases of physical adsorption, the chief characteristics of which are that it increases with pressure and approaches an asymptotic value usually representing a layer not exceeding one molecule in thickness, it decreases with increase in temperature and the heat of adsorption is of the order of 2,000 calories per gram molecule (gases diffusing through metals in the atomic and not in the molecular state, a conception originated by Ramsay). Adsorption and ionisation of the gas in the metal surface are the controlling factors in ordinary diffusion and account for the low rates at ordinary temperatures. The author outlines the experimental technique involved in studying the subject and discusses the laws of solubility and the effect of dissolved gases on the properties of metals. The volume is well illustrated and clearly written

The Superheterodyne Receiver. By A. T. WITTS. Pp. 182; figs. 98. London: Sir Isaac Pitman & Sons, Ltd. Price 3s. 6d. net.

This third edition of a book first published only three years ago has been enlarged by more than a third so as to include the latest developments of the superheterodyne receiver. The development, theory and present practice of superheterodyne circuits are dealt with simply and comprehensively without the use of mathematics, but no attempt is made to give practical hints in design or operation as the book is in the nature of a theoretical survey. The information has been brought up to date, some 1937 models being described, and a chapter added on television which forms an introduction to the general principles involved in television reception by superheterodyne circuits.

The development of the superheterodyne is described and the principles discussed, after which the circuits are considered in detail, followed by descriptions of modern receivers, the maintenance of receivers, and the use of the superheterodyne for television reception. The book should be of great value to those interested in the subject, especially amateur constructors, service engineers and students.

Shorter Notices

A general survey of the most up-to-date practice in dealing with the problems of factory and workshop organisation and management is given in "Training in Foremanship and Management," by J. J. Gillespie (Sir Isaac Pitman & Sons, London, 7s. 6d.), the second edition of which has recently been issued. This edition, containing 179 pages and thirty-five figures and tables, has been rewritten.

"Business Charts," by T. G. Rose (Sir Isaac Pitman & Sons, Ltd., London, 7s. 6d.), has reached its third edition. It now includes a short section describing the making of a Gantt chart and a number of minor alterations have been made to bring the book up to date. A section has also been added mentioning certain books which are illustrated entirely by charts and are in themselves excellent samples of the practical use of graphics.

"How to Patent and Commercialise Your Inventions," by Dorothy B. Miller (Sir Isaac Pitman & Sons, Ltd., London, 2s. 6d.), is a 63-page book dealing with the practical steps which British inventors should take to protect their inventions. Miss Miller, herself an inventor, gives a detailed account of procedure, and is especially helpful upon the subject of costs.

"An Outline of Atomic Physics," by members of the Physics Staff of the University of Pittsburgh. (Second edition.) Pp. 414; figs. Price 18s. 6d. "Fundamentals of Engineering Electronics," by W. G. Dow. Pp. 604; figs. Price 25s. London: Chapman & Hall, Ltd.

"Strom-und Spannungswandler," by Dr.-Ing. Michael Walter. Pp. 159; figs. 163. München: R. Oldenbourg. Price Rm.8.80.

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

Thorpe & Thorpe Country Services, Ltd.—Private company. Registered August 18th. Capital, £600. Objects: To carry on the business of electrical engineers, &c. The subscribers are: V. C. Jones, 6, Avery Road, Bond Street, W.; and M. C. Jones, Threshers Dean, Headley, near Epsom, Surrey, electrical engineer. M. C. Jones is first director. Registered office: Bush House, Aldwych, W.C.2.

Discharge Lamps, Ltd.—Private company. Registered August 16th. Capital, £1,000. Objects: To carry on business as manufacturers of and dealers in discharge lamps of all kinds, mercury-vapour illuminants, &c. The subscribers are: A. Honeyball, 14, Fircroft Road, Upper Tooting, S.W.17; and I. G. Warren, 61a, Oakmead Road, S.W.12. Registered office: 3, London Wall Buildings, E.C.2.

British Electrical & Manufacturing Co., Ltd.—Private company. Registered August 17th. Nominal capital £65,000. Objects: To carry on the business of electricians, electrical engineers, suppliers of electricity and electrical apparatus for light, heat, motive power or otherwise, manufacturers and factors of and dealers in apparatus, parts, fittings and accessories used in connection with electricity or in connection with mines, railways, shipyards, cinemas, telephony, wireless, &c. The first directors are: R. R. Barkes, 38, Roker Park Road, Sunderland; and H. Barkes, Holmfield, Cleadon, Co. Durham. Secretary: H. Barkes. Solicitors: Charles Shortt & Co., 26, Mosley Street, Newcastle-upon-Tyne.

Precision Plastics, Ltd.—Private company. Registered August 16th. Capital, £2,000. Objects: To carry on the business of manufacturers of and dealers in bakelite, bakelite mouldings, erinoid, vulcanite, ebonite, fibre, leatheroid and all acetate plastic and synthetic materials, &c. The directors are: F. P. Smith, "Worlds End House," Solihull, Warwickshire; S. J. Smith, "The Kingpost," Hampton Lane, Solihull; and H. W. Eisner, 185, Quinton Road, Harborne, Birmingham, 17. Registered office: 70, Newhall Street, Birmingham.

Murphy Electrical, Ltd.—Private company. Registered August 16th. Nominal capital, £100. Objects: To carry on the business of manufacturers and repairers of and dealers in electrical machinery, plant, equipment and apparatus for every purpose, scientific and test instruments, lamps, valves, insulating materials, and radio, television and cinematograph apparatus, &c. The subscribers are: E. J. Power, 56, Blakemere Road, Welwyn Garden City; and F. J. Osborn, 16, Guessens Road, Welwyn Garden City. Solicitors: Clifford-Turner & Co., 11, Old Jewry, E.C.2.

Murphy Television, Ltd.—Private company. Registered August 16th. Nominal capital, £100. Objects: To carry on the business of manufacturers of and dealers in television and radio receiving, transmitting and communicating instruments and accessories, electrical engineers, &c. Subscribers and solicitors as above.

Murphy Instruments, Ltd.—Private company. Registered August 16th. Nominal capital, £100. Objects: To carry on the business of manufacturers of and dealers in measuring, observing and recording instruments, violet ray and X-ray tubes, laboratory, observatory, scientific, electrical, optical, nautical and drawing apparatus, radio and television sets, &c. Subscribers and solicitors as above.

Murphy Refrigerators, Ltd.—Private company. Registered August 16th. Nominal capital, £100. Objects: To carry on the business of manufacturers of and dealers in refrigerators, cold storage, cooling, insulating and condensing machinery, plant, apparatus, fittings and equipment, electrical engineers, manufacturing chemists, &c. Subscribers and solicitors as above.

Bilton Smith, Ltd.—Private company. Registered August 19th. Capital, £2,000. Objects: To carry on the business of electrical engineers, contractors, merchants, factors, wireless and television engineers, &c. The directors are: E. B. Smith, 2, Brunswick Gardens, Ealing, W.5 (permanent director and chairman), and three others. Registered office: 208, Ham Lane, Acton, W.3.

Holiday & Hemmerdinger, Ltd.—Private company. Registered August 20th. Capital, £1,500. Objects: To carry on business as public address engineers, radio and electrical engineers, &c. The permanent directors are: J. S. Holiday, 75, Grange Avenue, Cheadle Hulme, Ches, and C. A. Hemmerdinger, 6, Egerton Road, Chorlton-cum-Hardy, Manchester. Registered office: 74-78, Hardman Street, Manchester, 3.

Boddy's, Ltd.—Private company. Registered August 20th. Capital, £200. Objects: To carry on the business of electrical, radio and television engineers and contractors, &c. The life directors are: J. H. Boddy, 819, Fulham Road, S.W.6, and C. L. Machette, 160, Goldhurst Terrace, N.W.6. Registered office: 20, Bedford Row, W.C.1.

Petworth Auto Electric Services, Ltd.—Private company. Registered August 20th. Capital, £100. Objects: To adopt an agreement with Mrs. M. Streeter for the purchase of the business carried on by her at Petworth, Sussex, as "Auto Electric Services," and to carry on the business of manufacturers of and dealers in wireless goods of every description, musical instruments, electrical goods and apparatus, &c. The directors are: Mrs. M. Streeter and S. Streeter, both of Electric House, East Street, Petworth, Sussex. Registered office: Electric House, East Street, Petworth, Sussex.

Border Electrical Service, Ltd.—Private company. Registered August 18th. Capital, £3,000. Objects: To acquire the business of an electrical engineer carried on by T. Sinclair as Border Electrical Service at Berwick-on-Tweed. The directors are: T.

Sinclair (chairman), Clairholme, Reston, Berwick-on-Tweed, and E. W. Devenish, 4, Milfield Terrace, East Ord, Berwick-on-Tweed. Registered office: 8, Bridge Street, Berwick-on-Tweed.

Returns of Electrical Companies

Urban Electric Supply Co., Ltd.—Capital, £1,050,000 in 700,000 ordinary and 350,000 preference shares of £1 each. Return dated May 13th, 1937. All shares taken up. £675,025 paid on 425,025 ordinary and 250,000 preference. £374,975 considered as paid on 274,975 ordinary and 100,000 preference. Mortgages and charges, nil.

London Electric Wire Co. and Smiths, Ltd.—Capital, £1,250,000 in 750,000 ordinary and 500,000 preference shares of £1 each. Return dated May 20th, 1937. 684,070 ordinary and 400,000 preference shares taken up. £350,035 paid on 35 ordinary and 350,000 preference. £734,035 considered as paid on 684,035 ordinary and 50,000 preference. Mortgages and charges, nil.

Regentone Products, Ltd.—Satisfaction in full on July 24th, 1937, of charge dated September 3rd, 1935, and registered September 24th, 1935. (According to the register of mortgages the only charge registered September 24th, 1935, was a mortgage which originally secured £1,000 and further sums amounting therewith to a maximum of £3,300.)

United River Plate Telephone Co., Ltd.—(A) Particulars have been filed of bonds to secure 12,000,000 Swedish Kroner, the agreed equivalent of 9,876,000 Argentine pesos, authorised by resolutions of July 22nd and July 26th, 1937, and covered by trust deed dated August 1st, 1937, but actually executed on August 3rd, 1937, charged on the company's property, present and future, except property and assets in the United Kingdom. The whole amount is now issued. The trustees are the Bank of London and South America, Ltd., 6, 7 and 8, Tokenhouse Yard, E.C. (B) Particulars also filed of bonds to secure 40,500,000 Swiss francs, the agreed equivalent of 30,000,000 Argentine pesos authorised July 22nd, 1937, and covered by trust deed dated August 1st, but actually executed July 30th, 1937, charged on the company's property, present and future, except property and assets in the United Kingdom. The whole amount is now issued. The trustees are the Bank of London and South America, Ltd., 6, 7 and 8, Tokenhouse Yard, E.C.

Liverpool Electric Cable Co., Ltd.—Capital £300,000 in £1 shares. Return dated May 19th, 1937. 150,000 shares taken up. £127,833 paid, £22,167 considered as paid. Mortgages and charges nil.

Central Sussex Electricity, Ltd.—Capital, £230,000 in £1 shares. Return dated May 3rd, 1937. All shares taken up. £221,250 paid, being £1 per share on 180,000 and 16s. 6d. per share on 50,000 shares. Mortgages and charges nil.

John Davis & Son (Derby), Ltd.—Capital, £35,000 in 22,500 ordinary and 12,500 unclassified shares of £1. Return dated June 21st, 1937. 22,500 ordinary shares taken up. £15,000 paid, £7,500 considered as paid. Mortgages and charges nil.

Central London Tube Extensions

THE Great Western Railway has just completed contracts for the construction of a double electric track from North Acton to Greenford, a distance of more than three miles, and of a large car depôt at Ruislip. Work will begin immediately.

These are the first steps in a £2,500,000 scheme arranged jointly by the Great Western Railway and the London Passenger Transport Board to extend the Central London Tube to Ruislip, a distance of eight miles. Later the line will probably be continued to Denham, three miles farther on. The programme of works, now announced, is as follows:—The widening of the line from two to four tracks between North Acton and Ruislip (and later probably to Denham); electrification of the new lines on the low voltage, fourth rail system; and the projection over the new lines of a proportion of the Board's trains from the Central London line, thus placing Ruislip, Northolt, Greenford and intermediate stations in direct rail communication with the West End and the City.

There will be a fly-under junction at North Acton between the new lines and the Ealing and Shepherd's Bush (Great Western) line and a fly-over junction on the Great Western Company's Castlebar loop line at Greenford. Although the new lines will be parallel with an existing railway and in some instances will use the same stations, they will be reserved for Central London trains. New stations are to be built at Hangar Lane and Ruislip, while the platforms will be altered and other structural alterations made at Perivale, Greenford, Northolt, South Ruislip and Ruislip Gardens.

The double entry car depôt will be erected on the south side of the line between Ruislip and Ruislip Gardens stations, where there will be machinery for the maintenance, automatic washing and cleaning of cars. A similar depôt is being built at Hainault.

Tentative train schedules provide for a peak hour service of twelve eight-car trains an hour between North Acton and Greenford and of six trains an hour between Greenford and Ruislip. Nearly a hundred cars of the latest type will be needed. Four sub-stations will be built, probably at Brentham, Greenford, Northolt and Ruislip. The L.P.T.B. has decided to rename the Central London line the "Central" line and the Morden-Edgware line the "Northern" line.

City Notes

The Rangoon Electric Tramway & Supply Co. is paying an interim dividend of 6 annas per share, free of Burman income tax, on the ordinary shares (same).

The Clyde Valley Electrical Power Co. has announced an interim ordinary dividend of 3 per cent. (unchanged).

Cable & Wireless (Holding), Ltd., announces a dividend on the 5½ per cent., cumulative preference stock of 2¾ per cent., less tax, for the half-year to June 30th. At an extraordinary meeting held on August 19th Lord Pender (chairman) said that in the interests of economy, it had been decided not to fill the place of the late Marchese Marconi on the board, but to reduce the maximum number of directors to 15 and the minimum to eight.

Strand Electric Holdings is paying a final dividend of 6 per cent., making 10 per cent. for the year ended July 11th. A dividend of 8 per cent. actual was paid for the initial period from February 3rd, 1936, to July 11th, 1936.

Marconi's Wireless Telegraph Co. has declared an interim dividend of 2¾ per cent. on the ordinary shares. No interim dividend was paid a year ago, one payment of 7 per cent. being made for 1936 after the close of that year.

The Paterson Engineering Co. reports a profit for the year ended April 30th of £28,956, as compared with £22,585 in the preceding year. After deducting directors' fees, contribution to staff endowment insurance, &c., and the net dividend on the preference shares and tax, there is a balance available of £15,605 (against £10,153). It is proposed to pay a dividend of 10 per cent. on the ordinary shares, together with a bonus of 2½ per cent., and to carry forward £16,287 (against £10,057 brought in). In each of the three preceding years a dividend of 10 per cent. was paid.

The North-Eastern Electric Supply Co. is paying an interim dividend of 2½ per cent. on the ordinary stock (unchanged).

The Pennsylvania Water & Power Co. has declared a dividend of $1 on the common shares for the quarrer ending September 30th (unchanged).

The Farnham Gas & Electricity Co. is paying an interim dividend of 3 per cent, (same).

Stocks and Shares

TUESDAY EVENING.

THE serious aspect of the war between China and Japan is a predominant factor in the Stock Exchange markets of the moment. The news of the last few days suggests that Japan is getting ready for a lengthy period of hostilities. That China is perhaps rather unexpectedly well-prepared for meeting the Japanese seems reasonable to assume from the items of information that come through. The result, from the purely Stock Exchange point of view, is to impose a fresh reason for restraint upon investor and speculator alike. There is still a good deal of money available for employment; there is still a substantial volume of buying support for gilt-edged shares.

By way of illustration, a selection of preference shares, the yield on which at the present time is little more than 4 per cent. on the money, is given in the following paragraph. It will be noticed that some of the shares were included in a similar list printed here last month. The continued demand illustrates the tenacity with which shares of this calibre are retained by their proprietors who, however greatly they may be tempted to take advantage of the ruling quotations, find so much difficulty in substituting other investments for those which they already hold that they retain the latter interests.

Dealings started on Monday in this week in the 4 per cent. First Debenture stock of Telephone and General Trust. Particulars were advertised about a fortnight ago. The stock is dated 1957-67 and the present price is about 100.

Shares Wanted

That business in Stock Exchange securities is not of a one-way character at the present time is witnessed by the following selections from a list of preference shares which are wanted in the electrical market. The price quoted is the figure which buyers are willing to give for the issues named:—

Preference Shares.	Dividend.	Price Bid.
City of London	6	29/6
County of London	6	29/3
Metropolitan	4½	22/3
Midland Counties	6	28/–
Clyde Valley	6	30/6
Yorkshire Electric	6	29/3
Edmundsons'	7	33/–

The electricity supply market is a buyer, also, of certain debenture issues, among them being Lancashire Electric 5 per cent. debenture, for which 110 is offered; "Three Counties" 5 per cent. debentures wanted at 111½; Edmundsons' 4 per cent. debenture, at 102½; and North-Eastern Electric 5 per cent. debenture, at 104½.

The Investor's Choice

The comparatively sluggish flow of funds into stocks and shares continues to be occupied, to a large extent, with the sounder type of investments. Under these circumstances, electricity supply issues claim a fair proportion of the public's interest; the supply of shares has found a steady power of absorption. The following group of ordinary shares now on offer in the Stock Exchange and in provincial electricity sup-

ply companies, other than those quoted regularly in our lists, may be of service to the prospective investor. The yields in the third column are calculated upon the dividends last paid in each case :—

Ordinary Share.	Price.	Yield %.
		£ s. d.
Mersey Power	34/-	4 8 3
Mid-Cheshire Electric	36/6	4 7 6
Newcastle and District	32/3	4 6 9
North Somerset...	33/6	4 3 6
Rushden and District	39/6	4 1 0
West Devon	24/3	4 2 6

Suburban electricity supply companies' shares at present on offer in the Stock Exchange market include Hendon Electric, which can be bought at 46s. 6d. to yield £3 6s. 6d. per cent., free of tax; and Richmond (Surrey) Electric at 33s., on which the return is £4 4s. 9d. per cent.

Gilt-edged Stocks

The gilt-edged market has remained unflurried by the latest crisis with which markets have been called upon to contend. Prices of Government issues show little change, except in so much as they reflect a rather marked disposition on the investor's part to favour "dated" stocks at the expense of those without a definite time for redemption. A consideration helpful to prices is the knowledge that further issues of Corporation loans are not at present in prospect.

Cable and Wireless Preference

The intention to resume half-yearly payments on Cable and Wireless preference stock was mentioned at the last meeting; nevertheless, a rise of more than a point in the price of the stock followed the actual declaration of a 2¾ per cent. dividend. This was a signal of general satisfaction that the stock had at length returned to smooth waters. Arrears of dividend had, of course, been previously cleared up by the reconstruction scheme, stockholders receiving £7 6s. 9d. per cent. of the new income stock in satisfaction. That the margin of safety for the preference dividend has widened comfortably since the end of last year is evident from the table of traffic indices; the July figure is again the best for that month over a number of years. Allowing for deduction of the dividend from the price, Cable and Wireless preference yields £5 3s. 9d. per cent. on the money. The unusual declaration, by Marconi's Wireless Telegraph, of a 2¾ per cent. interim dividend, doubtless had a bearing on the Cable and Wireless decision. The Marconi company, which is controlled by Cable and Wireless, paid 7 per cent. for the whole of last year. Globe Telegraph ordinary, at 16¾, have continued on the upgrade; Cable and Wireless ordinary at 83 is lower on the week.

Home Rails

The home railway market has been prevented by general conditions from giving any real sign of its reaction to recent developments, although these have been of a kind which may have an important bearing on prices in more normal times. A balance has to be determined between, on the one hand, the decision to raise fares and freights, and, on the other, the wages award which will restore the remainder of the wage cuts, besides making other concessions to the men. Until the weight of present neglect is removed it remains a matter for guesswork as to the way in which the scales of price movements may be tilted. The terms of the award were a little stiffer, from the companies' point of view, than had been generally expected. Not everyone was prepared for the extra concessions, which will bring the cost of the award to the companies to practically £3 millions in a full year. Nevertheless, opinion is sufficiently satisfied and relieved at the prospect of higher charges, and of freedom from labour uncertainties, to accept the position fairly cheerfully. Market prophets foresee a reversal of the present sagging trend of prices when circumstances become more favourable.

Buenos Aires Transport

According to a statement issued by Buenos Ayres Lacroze Tramways, the proposed Buenos Ayres Transport Corporation will probably be constituted some time next year. The Corporation is intended to acquire and operate public transport undertakings on much the same lines, apparently, as those followed by London's Transport Board. The change will not come too soon for some of the local companies. The B. A. Lacroze concern has itself had recourse to drastic measures in order to keep head above water until relief appears in the shape of the new body. Holders of the debentures have to agree to further extension of the moratorium scheme and also to cancellation of a good part of interest in arrear. Without some such plan it seems that the company would be exposed to risk of liquidation before the chance arose for obtaining anything like good terms on its transfer to the new Corporation. On those terms depend the debenture holders' principal hopes of a reasonable return of capital. The three classes of 5 per cent. debenture stock are quoted at prices between 10 and 20.

Mexican Light and Power 5 per cent. bonds are marked down 6½ points. Brazilian Tractions have lost 1¼ on profit taking—part of it from Montreal and Brussels. United States dollar stocks have given way on New York selling induced by the situation in the Far East.

Share List of Electrical Companies

Home Electricity Companies.

	Dividend. Nom.	Previous.	Last.	Price Aug. 24.	Rise or Fall.	Yield p.c. £ s. d.
Bournemouth and Poole	1	15	15	67/6	—	4 9 6
City of London	1	7½	7½	54/6xd	+6d.	4 7 0
Clyde Valley	1	7	8	2	+6d.	4 0 0
County of London...	1	10½	10½	50/-	—	4 4 0
Edmundson's 7% Pref.	1	7	7	33/6	—	4 3 7
Do. Ord.	1	8	9	39/-	—	4 12 4
Elec. Dis. Yorkshire	1	9	9	41/-	—	4 7 10
Elec. Fin. and Securities	1	12½	12½	2 11/16	—	4 13 0
Elec. Supply Corporation ...	1	11	12	52/6	—	4 11 5
Lancs Light and Power	1	7½	7½	34/-	—	4 8 3
Lond. Assoc. Electric	1	—	7	31/3	—	4 9 6
London Electric	1	7	8	35/6	—	4 10 2
London Power Deb. Red. ...	Stock	5	5	105¼xd	+1¼	4 14 9
Metropolitan	1	10	10	46/-	—	4 7 0
Midland Counties	1	7½	8	37/-	—	4 6 8
Mid. Elec. Power	1	8	9	2 1/16	+ 1/16	4 7 5
North Eastern Electric Ordinary	1	6	7	32/6	—	4 6 2
Do. 7% Pref.	1	7	7	34/6	—	4 1 2
Northampton	1	10	10	46/3	—	4 6 7
Notting Hill 6% Pref.	10	6	6	14	—	4 5 9
North Met. Elec. Ordinary ...	1	10	10	49/3	—	4 1 2
Do. do. 6% Pref. ...	1	6	6	30/6	—	3 18 8
Scottish Power	1	8	8	37/6	+6d.	4 5 4
South London	1	7	7	32/-	—	4 7 6
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	23/6	—	6 7 8
Yorkshire Elec.	1	8	8	39/6	+6d.	4 1 1

Public Boards.

Central Electricity, 1950–70 ...	Stock	5	5	113	—	4 8 6
Do. 1955–75 ...	,,	5	5	116	—	4 6 2
Do. 1951–73 ...	,,	4½	4½	109	—	4 2 7
Do. 1963–93 ...	,,	—	3½	97½	—	3 11 10
London Elec. Trans. Gtd. ...	,,	—	2½	86	—	2 18 1
London & Home Counties, 1955–75	,,	4½	4½	109	—	4 2 7
London Passenger Transport, A...	,,	—	4½	114½	—	3 18 7
Do. do. B...	,,	—	5	117½	—	4 5 1
Do. do. C...	,,	4	4	82	—	4 17 9
West Midlands Joint Elec. 1948–68	,,	—	5	111½	—	4 9 8

Telegraph and Telephone.

American Tel. & Tel.	$160	9	9	170½	−1	5 5 7
Anglo-Am. Tel. Pref.	Stock	6	6	122½	—	4 18 0
Do. Def.	,,	1½	1½	29½	—	5 1 8
Cable & Wireless 5½% Pref. ...	,,	4½	5½	106xd	+1½	5 3 9
Do. Ord.	,,	—	—	83	−1	—
Do. Income	,,	—	—	101½	—	3 18 10
Globe Tel. & Tel. Ord. ...	10	4½*	5½*	16¾	+⅛	3 5 8
Do. do. Pref. ...	10	6	6	14½	—	4 5 9
Great Northern Tel.	10	20	20	42	−½	4 15 3
Marconi-Marine	1	10	7½	37/6	—	4 0 0
Oriental Telephone Ord.	1	12*	12*	3¼	—	3 16 10

Home and Foreign Trams, etc.

Anglo-Arg. Trams First Pref. ...	5	Nil	Nil	5/-	—	—
Do. do. 2nd Pref.	5	Nil	Nil	3/9	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	21½	—	—
British Electric Traction Def. Ord.	,,	5	5	1275	—	—
Do. do. Pref. Ord.	,,	8	8	168	—	4 15 5
Brazil Traction	$100	40 cts.	50 cts.	25½	−1½	—
Brit. Columbia Elec. Rly. Pce. ...	Stock	5	5	105½	—	4 14 9
Mexican Light Common	$100	Nil	Nil	2	—	—
Do. 1st Bonds...	$500	5	5	33	−6¼	—
Victoria Falls Ord.	1	20	12	66/3	− 1/16	3 12 6
West Riding	1	6½	10	43/9	—	4 11 4

Manufacturing Companies.

Aron Electricity Ord.	1	15	15	2½	—	6 0 0
Assoc. Elec. Ord.	1	8	10	49/6	—	4 0 8
Do. Pref.	1	8	8	37/6	—	4 5 3
Babcock & Wilcox	1	8	10	48/6	−1/-	4 2 6
British Aluminium Ord.	1	7½	10	55/-	+1/-	3 12 9
British Insulated Ord.	Stock	20	20	4 1/16	− 1/16	4 1 0
Brush Ord....	Stock	Nil	Nil	50½	—	—
Callender's	1	15	15	4 11/16	—	3 2 3
Do. 6½% Pref.... ...	1	6½	6½	30/-	—	4 6 8
Crompton Parkinson Ord. ...	5/-	12½	12½	3	—	—
Do. 8% Pref.	1	8	8	37/6	—	4 5 4
Electric Construction	1	7	10	2½	—	4 14 1
Enfield Cable Ord.	1	25	25	5 1/16	—	4 8 0
English Electric	1	Nil	Nil	34/6	+6d.	—
Do. do. Pref.	1	6½	6½	26/6	—	4 18 1
Ericsson Tel.	5/-	20	25	2½	—	2 5 6
Ever Ready	5/-	35	45	32/9	—	6 16 6
Ferranti Pref.	1	7	7	27/6	—	5 1 10
G.E.C. Pref.	1	6½	6½	32/6	—	4 0 0
Do. Ord.	1	15	17½	86/-	—	4 1 4
Henley's	5/-	30	15	20/6	—	3 13 2
Do. 4½% Pref.	1	4½	4½	1½	—	4 0 0
India-Rubber Pref.	1	5½	5½	21/3	− 1/16	5 3 6
Johnson & Phillips	1	7½	10	47/-	—	4 5 1
Lancashire Dynamo	1	10	20	3 1/16	—	5 8 4
Siemens Ord.	1	6	7½	33/9	—	4 19 0
Telegraph Construction	£1	Nil	7½	2½	—	2 17 2

* Dividends are paid free of Income Tax

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings taken.

1935

29425. "Alternating current modulation and demodulation systems." F. C. Williams. October 24th, 1935. (469472.)
29829. "Electrical railway toy." Vereinigte Spielwarenfabriken A. Fortner & J. Haffner's Nachfolger Ges. and S. Kahn. October 29th, 1935 (addition to 30095/35.) (469656.)
30027. "Contact-members for electrical switches of the smaller kind." G. E. Crabtree, W. T. Elliott, E. Badham and R. W. Thornton (legal representatives of J. A. Crabtree, decd.). October 31st, 1936. (Addition to 465063.) (469543.)
33235. "Automatic making, breaking, and regulating electric circuits by variations of speed." A. P. Pearce. November 26th, 1936. (469657.)
35698. "Pinch for electric lamps, thermionic valves, and similar evacuated vessels." A. H. Johnson. December 24th, 1935. (469606.)

1936

1975. "Electric testing and measuring apparatus." H. S. Walker and W. G. Ansell. January 21st, 1936. (469553.)
2288. "Dry electric rectifiers." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. March 11th, 1935. (Addition to 378444.) (469610.)
2291. "Electric relay apparatus." R. C. Graseby. January 24th, 1936. (469611.)
2436. "Electrolytic condensers." Hydrawerk Akt.-Ges. January 28th, 1935. (469729.)
2511. "Electron-discharge devices." M. Harman. January 25th, 1935. (469558.)
2535/6. "Combinations of electric-discharge devices with materials excited to luminescence by the electric discharge." General Electric Co., Ltd., and J. T. Randall. January 27th, 1936. (469731/2.)
2584. "Sparking plugs." P. L. Alby. January 25th, 1935. (469565.)
2586. "Electron-discharge devices." Marconi's Wireless Telegraph Co., Ltd. January 30th, 1935. (469477.)
2609. "Type-printing telegraphic system." F. Laudano. January 29th, 1936. (469662.)
2652. "Electro-magnetic sound-producing apparatus." F. R. F. Ramsay. January 29th, 1936. (469736.)
2705. "Automatic switches for use in telephone or like systems." Automatic Electric Co., Ltd., R. Taylor and G. T. Baker. January 29th, 1936. (469664.)
2710. "Retarded or delayed action electric motor controller or switching device." A. E. Morrison & Sons, Ltd., A. E. Morrison, and A. C. Morrison. January 29th, 1936. (469665.)
2798. "Tuning of radio-receivers with interchannel noise suppression." E. K. Cole, Ltd., and G. Bradfield. January 30th, 1936. (469670.)
2823. "Electrical heating systems for the warming of buildings." J. L. Musgrave, and R. Crittall & Co., Ltd. January 30th, 1936. (469744.)
2849. "Mounting of electric-discharge devices." British Thomson-Houston Co., Ltd, H. Cheney and J. G. Brett. January 30th, 1936. (469671.)
2850. "Driving of magneto-electric devices." British Thomson-Houston Co., Ltd., L. Griffiths and S. H. Franklin. January 30th, 1936. (469672.)
2854. "Television and like apparatus." Baird Television, Ltd., and J. L. Baird. January 30th, 1936. (469673.)
3067. "Hooks for supporting lightweight electric conductors." M. H. Goldstone. February 1st, 1936. (469745.)
3500. "Apparatus for temporarily laying electric cables." I. T. Kempe. February 5th, 1936. (469620.)
3577. "Electric hand-irons." W. J. Hill. February 6th, 1936. (469679.)
3601. "Electro-deposition of metals." A. I. Wynne-Williams. February 6th, 1936. (469681.)
4118. "Switches for converting electric currents." General Electric Co., Ltd., and R. Le Rossignol. February 11th, 1936. (469481.)
4642. "Means for illumination utilising electric-discharge devices." General Electric Co., Ltd., J. T. Randall, and J. W. Ryde. February 15th, 1936. (469485.)
5534. "Electro-deposition of metals." A. I. Wynne-Williams. February 24th, 1936 (Cognate application 5535/36). (469689.)
6099. "Electron-discharge devices and circuits therefor." Marconi's Wireless Telegraph Co., Ltd. February 28th, 1935 (Cognate application 6100/36). (469488.)
8203. "Electric cables." A. W. Williams. March 19th, 1936. (469495.)
8892. "Electric-discharge devices." British Thomson-Houston Co., Ltd., and S. R. Eade. March 25th, 1936. (469499.)
11910. "Short-wave television transmitter." Radioakt.-Ges. D. S. Loewe. April 30th, 1935. (469628.)
11968. "Anodic coating of aluminium and aluminium alloys, and electrolytes therefor." Schering-Kahibaum Akt.-Ges. November 30th, 1935. (469571.)
15667. "Electro-mechanical periodically winding device for winding the spring of a clockwork mechanism." R. Fouques and J. Lenfant. July 3rd, 1935. (469698.)
20441. "Gas or vapour filled electric-discharge tubes, and devices comprising such tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. September 24th, 1935. (469631.)
26059. "Metal seals for metal envelope electric-discharge devices." British Thomson-Houston Co., Ltd. September 27th, 1935. (469524.)
28626. "Image suppression system for superheterodyne radio receivers." Philco Radio and Television Corporation. November 5th, 1935. (469579.)
31804. "Electric-discharge tubes." Standard Telephones and Cables, Ltd. March 21st, 1936. (469584.)
34824. "Electric lamps combined with wireless or like apparatus." F. Ditisheim. June 30th, 1936. (469586.)

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326. "Electric devices in which a picture set up by electrons is projected on a projection surface. Naamlooze Vennootschap Philips' Gloeilampenfabrieken. January 8th, 1936. (469588.)
2726. "Wireless antennae." Standard Telephones and Cables, Ltd. March 17th, 1936. (469589.)
4244. "Apparatus for electrocuting animals." A. D. Clarke, H. F. Roberts and G. H. Vaughan. February 12th, 1937. (469647.)
8538. "Electric switches with self-generated arc-quenching gas." British Thomson-Houston Co., Ltd. March 23rd, 1936. (469596.)
8732. "Transmission systems for electrical signals." Siemens and Halske Akt.-Ges. March 24th, 1936. (469597.)
9401. "Means for producing multiple flash signals." Svenska Aktiebolaget Gas Accumulator. April 3rd, 1936. (469599.)
10958. "Electric-discharge oscillator." British Thomson-Houston Co., Ltd., April 16th, 1936. (469600.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from August 18th.

Romac. No. 577451. Class 8. Philosophical and scientific instruments and apparatus for useful purposes.—Romac Motor Accessories, Ltd., Romac Works, The Hyde, Hendon, N.W.9.

Migrant. No. 578429. Class 8. Philosophical and scientific instruments and apparatus for useful purposes.—Burndept, Ltd., Buchanan Buildings, 24, Holborn, E.C.1.

Asmalator. No. 577942. Class 11. Electrically driven spraying devices for use with medicated vapours in the treatment of respiratory diseases.—H. P. Bloom, 60, High Holborn, W.C.1.

Electric Traction in Greece

AN Athens correspondent states that the supplementary concession recently signed between the Hellenic Government and the Electric Transport Co. in Athens terminates protracted negotiations, and will result in the reorganisation of communications between Athens and The Piræus and the suburbs of both cities. The existing electric railway is to be extended to Kefissia, a distance of about 14 km., by a double line with a live rail to operate at 600 V, and intermediate stations will be built at Alysida, Nea Ionia, Heracleia and Amaroussi.

The new stations will each consist of two reinforced concrete platforms connected by overhead bridges. There will be no level crossings. The new rolling stock will consist of at least eight trains (each composed of two carriages on triple bogies) with d.c. machinery and fitted with air, electric and hand brakes. They are to maintain a minimum speed of 30 km. per hr. inclusive of stoppages at stations. The transport capacity of each train will be about 200 passengers in first and third class compartments.

Any necessary footbridges across other parts of the line will be erected by the Hellenic Government, which will also effect the requisite ground appropriations and compensate the owners. The work is to be completed within two years from the date of commencement and the company will pay the Hellenic Government the sum of 21,000,000 dr. towards defraying the cost of constructing footbridges, &c.

Electric tramway extensions of 680 metres in Athens and 900 metres in The Piræus will also be constructed, and two electric trolley-bus services between The Piræus and New Phaleron will replace the existing tramway services. New motor bus services are also to be established between Athens and the suburbs of Psychico, New Smyrna and Old Phaleron, to which the existing electric tramway services may be discontinued at the option of the company, which will also inaugurate a motor bus service between Old Phaleron and The Piræus. The company will provide sixty new heavy-oil engine motor buses and the same number of new tramcars.

The Electric Transport Co. is to raise the necessary capital by the issue of sterling shares, which will rank subsequent to those previously issued, bearing a maximum interest of 6 per cent., and redeemable in twenty-two years from July 1st, 1940.

A Radio Valve Booklet

A new edition of the "Osram Valve Guide," published by the General Electric Co., Ltd., has just been issued. The set designer will find that the guide forms a handy pocket book giving ready reference to the characteristics and pin connections of all types of valves suitable for his requirements in 2-V battery a.c. and d.c. receivers. For the experimenter the numerous circuit diagrams should prove of service. In the guide are catalogued not only all the valves required for replacement purposes in receivers made by the G.E.C. but also for the majority of other British-made receivers. The guide can be obtained free on request at any of the branch establishments of the G.E.C., or from the Head Office, Magnet House, Kingsway, W.C.2.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdare.—Clinic and offices at Rock Grounds, for U.D.C.; engineer, Town Hall.

Aberystwyth.—Agricultural research block, Penglaise, for the University College of Wales.

Ashington.—Bakery, Institute Road, for the Ashington Co-operative Society; Glass, Harrison and Ash, architects, 20, Saville Row, Newcastle-on-Tyne.

Aspull (WIGAN).—Houses (50), off Wigan Road; U.D.C. surveyor, Council Offices.

Barnet.—Enlargement of Queen Elizabeth Grammar school (£16,995); Herts Education Committee.

Berkshire.—School, Woodley (£19,700), for County E.C.

Bilton.—Junior and infants' school, between Townsend Close and Bilton Hall; managers, C.O.E. School.

Birmingham.—Alterations to the Gaiety Theatre, Coleshill Street (electrical work); Associated British Cinemas, Ltd., London. Factory in Argyle Street, for M. B. Wild & Co. (electrical work); W. Wilkinson, Ltd., builders, Handsworth. Buildings in Yardley Road (electrical work); W. J. Whittall & Son, builders, Lancaster Street. Cinema in Bristol Road South, Northfield (electrical work); C. H. Stanley, Langleys Road, Selly Oak. Factory, Branston Street, for Harrison Bros.; Gateley & Parsons, architects, 105, Colmore Row.

Bracebridge Heath (LINCOLN).—Nurses' home, Bracebridge Mental Hospital, for the Visiting Committee; H. S. Hall, architect, 26, South St. Mary's Gate, Grimsby, Lincolnshire.

Bristol.—Cinema, Union Street, for Odeon Theatres, Ltd.; J. Knox, builder, Coronation Road.

Bromley.—School, Southborough Park (£17,579); Education Committee.

Chelmsford.—Development of the Moilsham Lodge estate; Elliott & Archer.

Cheshire.—School at Green Lane, Altrincham, for E.C.; F. Anstead Browne, county architect, The Castle, Chester.

Chesterton.—New works (£50,000), adjoining present works in Apedale Road, for Howle Brick & Tile Co.

Chipping Sodbury.—Houses (32), Park Lane and Watleys End, for R.D.C.; H. C. James, housing supervisor, Council Offices.

Devon.—Hospital block, nurses' home, duty room, &c., at Hawkmoor Sanatorium, Bovey Tracey (£36,698), for E.C.; N. Pratt & Sons, builders, Clyst St. Mary, Exeter.

Dronfield.—Houses (24); T. Ward, Holmley Lane.

Dudley.—Factory in King Street (electrical work); A. J. Crump & Son, builders, Aston Road.

Fencehouses (Co. DURHAM).—Cinema (900 seats) for Northern Cinemas De Luxe; E. M. Lawson, architect, Barras Buildings, Barras Bridge, Newcastle-on-Tyne.

Finchley.—Flats on the Ellerton Lodge estate, East End Road; E. C. Skuce.

Flintshire.—Additions to the Hawarden County school, near Chester, for the Education Committee (£25,000); Shone Bros., "Horse and Jockey," Buckley, near Chester.

Forehoe and Henstead.—Houses (110), between Stafford Avenue and Water Lane, for R.D.C.

Galashiels.—Cinema; McNad & Elder, 272, St. Vincent Street, Glasgow.

Gateshead.—Houses, at Lobley Hill, for the T.C.; borough engineer.

Glasgow.—Assistance offices, John Street (£8,546); Gray's Ferro Concrete Co. Works extensions, South Street; Albion Motors, Ltd. Works extensions, Polmadie Road; Acme Tea Chest Co. Alterations to Lyceum Cinema; Caledon Pictures, Ltd. Isolation hospital, Cowglen (£07,583); A. M. Macdougall & Co.

Grimsby.—Aerodrome development (£7,120); borough engineer.

Heckmondwike.—Factory extensions; T. F. Firth & Son, Flush Mills.

Hertfordshire.—Senior boys' and girls' school and junior school extension, Crabtree Lane, Hemel Hempstead, for E.C. (£49,787); J. Meade, Ltd., builders, Berkhamsted Road, Chesham.

Heston and Isleworth.—Junior and infants' school (400 places), Norwood Green, Middlesex; J. G. Carey, borough surveyor, Council House, Hounslow.

Honley (YORKSHIRE).—Houses (34), Bradshaw Road and Meltham Road; P. N. Brown, architect, Hollowgate, Holmfirth.

Huntingdon.—New secondary school, Brampton Road, for County E.C.; T. H. Longstaff, county architect, Walden House

Irish Free State.—(KILKENNY).—Dwellings (54), for the Corporation; R. F. Bowen, engineer and borough surveyor, City Hall. (SLIGO).—Technical school, for the Vocational Education Committee; Vincent Kelly, architect, 87, Merrion Square, Dublin. (TULLAMORE).—Spinning mill; T. J. Cullen, architect, 25, Suffolk Street, Dublin. (TYRONE).—County Hospital extensions (£40,000); G. R. Ferguson and S. M'Ilveen, architects.

Isle of Ely.—Senior school, Saffron Close, Littlefort; County E.C.

Isle of Wight.—Fire station, Freshwater, for R.D.C.; E. L Smith, architect, High Street, Newport.

Kearsley (FARNWORTH).—Houses (36), Hulme Road estate, for U.D.C.; J. F. Moyse, surveyor, Council Offices.

Kent.—Extensions, hospital block and nurses' home, Leybourn Grange Colony, West Malling (£40,694), for C.C.; J. A. Davison & Son, builders, West Malling.

Kilsyth.—Houses (300), Balnallach estate, for T.C.; burgh surveyor, 36, Main Street.

Lanarkshire.—Hotel and annexe at Newhouse (£30,000); Provost Chassels, Coatbridge.

Lancashire.—School, Hope Park, Prestwich and extensions to Grammar school, Chadderton (£13,213), for County E.C.

Lanchester.—Houses (50) for the R.D.C.; North-Eastern Housing Association, Northumberland Road, Newcastle-on-Tyne.

Larbert.—New nurses' home (£50,000), for the Stirling District Mental Hospital Joint Committee.

Leadgate (Co. DURHAM).—Houses (72), Ponthead, for the North-Eastern Housing Association; N. T. Barker, builder, Blaydon-on-Tyne.

Leeds.—Flats (80), Camp Field area, for Town Council; R. A. H. Livett, housing director, 26, Great George Street. Estate development at Cottingley Hall, Elland Road; J. W. Watson & Sons. School, Outgand Lane; Education Committee.

Little Lever (BOLTON).—Houses (34), School Street housing estate, for U.D.C.; T. Grant, surveyor, Council Offices.

Little Shurdington.—Estate development; Gloucestershire Tile & Sand Co.

London.—(ACTON).—Town hall and offices, adjoining existing offices in Winchester Street; borough engineer, Municipal Offices. (BETHNAL GREEN).—Council chamber, offices, electricity showrooms, &c., for B.C.; E. C. P. Monson, architect, Finsbury Pavement House, E.C.2.

Longford.—Factory in Bedford Road; W. Stafford, Longford Road.

Macclesfield.—Houses (47), on Clifford Road and Arlington Drive, for C. Ogle (Macclesfield), Park Brook estate; H. McLellan, architect, 72, Woodsmoor Lane, Stockport.

Monmouthshire.—Junior mixed and infants' school, High Cross, Rogerstone, near Newport; C. L. Jones, architects, County Hall, Newport.

Neath (GLAMORGAN).—Houses (40), rear of Mary Street, Seven Sisters, for R.D.C.; J. T. Jones, engineer, 13, Orchard Street.

Newcastle-on-Tyne.—School (1,120 persons), at Wickham View, Benwell; F. Harvey, architect, Education Offices. Cinema in Pilgrim Street for Odeon Cinemas, Ltd. (£50,000); Cussins, Ltd., contractors, Gosforth.

Newton-in-Makerfield.—Additional offices, adjoining main Town Hall building, Earlestown, for U.D.C.; J. Walmsley, surveyor, Town Hall, Earlestown, Newton-le-Willows, Lancashire.

Northampton.—Children's homes (£3,143), St. David's estate; borough engineer.

Northern Ireland.—(BELFAST).—Extensions to offices, Stormont, for Government of Northern Ireland (£24,000); Sir A. Thornley, architect, Royal Liver Buildings, Liverpool.

Oxford.—Swimming baths, &c., Temple Road, Cowley (£15,452), for T.C.; A. Morris, builder, Elms Road, Botley.

Penrith.—Houses (34), Raiselands Croft estate; T. F. Simmonds, U.D.C. surveyor, Town Hall.

Penybont.—Clinic buildings for the R.D.C. in Waunbont Road (electrical work); J. Simon Davies, surveyor, Coity Road, Bridgend.

Reading.—Houses (108), Whitley estate; housing architect, St. Laurence's Churchyard.

Rochdale.—Cinema (1,800 persons), for Associated British Cinemas, 30-31, Golden Square, London, W.1; Lane, Fox & Co., contractors, Norton House Hill, Norton Road, Stockton-on-Tees, Durham.

Rugeley.—Elementary school (£38,365); Staffs Education Committee.

St. Austell.—Hospital (£50,000), for the Hospital Trust.

St. Helens.—Showroom buildings in Cotham Street (electrical work); Biram & Fletcher, architects, 17, George Street.

Sale.—Houses (280), Derbyshire Road South; Syddall & Baines, builders, Bloomsbury Lane, Timperley, Altrincham. Development of Greenway Close, The Avenue, for housing estate; Grays Estates, Ltd., 16, John Dalton Street, Manchester.

Sheffield.—Flats (20), Little Norton Lane, for J.G. Charitable Trust; A. Bradbury & Sons, contractors, Cemetery Road. Warehouse and offices in Queens Row for Nichols & Co. (Sheffield); D. O'Neill & Son, Solly Street.

Southampton.—Junior schools, Bitterne Park (£13,735), for T.C.; Jenkins & Son, Ltd., builders, 1, Waterloo Terrace.

South Shields.—Hotel, Highfield Road, for McEwan & Co., Ltd.; G. Henderson, contractor, Boldon Lane, East Boldon.

Stockton-on-Tees.—Additions to isolation hospital for the T.C. (£2,000); W. Cowan & Son, builders, 56, Skinner Street. Houses (100) on Robinsons Land, for the T.C.; borough engineer.

Stratford-on-Avon.—Houses (60), on Birmingham Road, for N. C. Joseph, Aluminium Works; L. L. Dussault, architect, 39, Newhall Street, Birmingham, 3.

Strood (KENT).—Houses (28); W. J. Stimpson, architect, Council Offices, Frindsbury Hill. Ritz cinema, for Union Cinemas, Ltd.

Sunderland.—Flats (140), in the East End, for the T.C.; borough engineer. Flats (44), High Street East, for North Eastern Housing Association; J. E. Lewis, borough engineer, Town Hall.

Walsall.—Premises in Park Street for Marsh & Baxter, High Street, Brierley Hill.

Warrington.—Houses (72), on Thelwall Hall estate, for D. P. Walsh (Estates), 78, King Street, Manchester; F. Curbishley & Co. (Warrington), 54, Massey Brook Lane, Lymn.

Wellingborough.—Clothing factory at Thrapston, for the Ideal Clothiers, Victoria Road; O. Roff, architect, Midland Road.

Wellington (SOMERSET).—Dwellings (50), Longforth estate, and Rockwell Green, for U.D.C.; E. T. Howard, architect, 67, High Street.

West Bromwich.—Factory, Queen Street, for Simms & Gipp (electrical work); Dallow & Son, builders, High Street.

West Hartlepool.—Houses (58); F. Durkin, borough engineer.

Worcester.—Reconstruction of Whitehead school (£34,539); Education Committee.

Worcestershire.—Senior mixed school, Blackminster, Evesham, for Education Committee; A. V. Rowe, county architect, 38, Foregate Street, Worcester.

Wrexham.—Factory at Twil Farm, Bangor-on-Dee; Cadbury Bros., Ltd., Bournville.